

# PHALANX

The Magazine of National Security Analysis | March 2014

## Education and Professional Development Colloquium 2014: Energizing Our Rising Members



Volume 47, Number 1

In This Issue:

- EPD Colloquium
- Industry Day
- Webinar series

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>MAR 2014</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2014 to 00-00-2014</b>	
4. TITLE AND SUBTITLE <b>Phalanx. Volume 47, Number 1.</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Military Operations Research Society, 2111 Wilson Boulevard, Suite 700, Arlington, VA, 22201</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>56</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			



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The Phalanx (ISSN 0195-1920) is published quarterly, \$40.00 for one year or \$70.00 for two years (US Rates) by the Military Operations Research Society in cooperation with the Military Applications Society (MAS) of the Institute for Operations Research and Management Science (INFORMS). Principal office: 2111 Wilson Blvd, Suite 700, Arlington, Virginia 22201. Periodicals postage paid at Arlington, and at additional mailing offices. POSTMASTER: Send address changes to Phalanx, 2111 Wilson Blvd, Suite 700, Arlington, Virginia 22201. Please allow 4-6 weeks for address change activation.

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## An Adaptive Society Supporting Your Career

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Several past *Phalanx* articles have emphasized the need for our Society to adapt to the changing fiscal environment in order to provide you with the professional services you need. In fact, the title of my December article was “Learn, Adapt, Survive, and Thrive!” Now that we are a full year into the effects of sequestration, budget reductions, and travel restric-

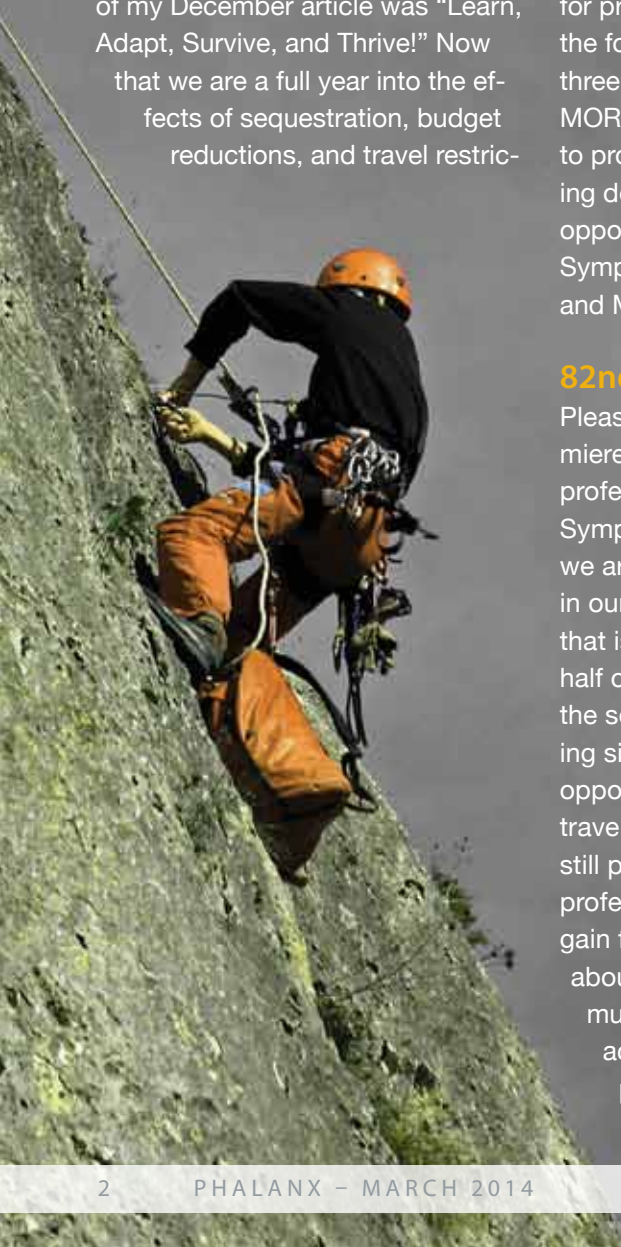
tions, I am happy to report that MORS is indeed learning, adapting, and surviving, and we have “thriving” in our crosshairs! Although we must remain realistic about the future, our outlook for this new year is one of excitement and opportunity for professional development. In the following paragraphs, I describe three noteworthy areas in which MORS has adapted and continues to provide you with career-enhancing development and collaboration opportunities: the 82nd MORS Symposium, our Special Meetings, and MORS Local Chapters.

### 82nd MORS Symposium

Please join us for this year’s premiere event for operations research professionals, the 82nd MORS Symposium. For the second year, we are holding the Symposium in our nation’s capital, a location that is considered local to about half of our membership. And for the second year, we are offering significant virtual participation opportunities for those unable to travel. Even better: the Symposium still provides a rich forum for OR professionals to present their work, gain feedback from peers, learn about other projects in the community, make and grow lifelong acquaintances, and enjoy the professional camaraderie ever present in our Society.

Symposium Chair Rochelle Anderson, Working Group/Composite Group Chair Sheilah Simberg, Special Sessions Chair Hunter Marks, and 83rd Symposium Chair Ronda Syring are leading a cast of “Energizer Bunnies” that have put together an impressive schedule of educational and professional development events. That schedule includes the full set of virtual sessions conducted over Defense Connect Online (DCO) June 4–6, and the main event, live and in-person, from June 16–19 in Alexandria, Virginia. Both live and virtual venues offer unclassified and classified sessions, and allow participation by our Five Eyes allies. Be sure to check out the MORS website for more details.

Our opening plenary session will be a special event, with Mrs. Katrina G. McFarland, Assistant Secretary of Defense (Acquisition) delivering the keynote address (see Mrs. McFarland’s bio on page 26). Immediately following the keynote, we will engage our government sponsors in a panel discussion, with ample time for questions taken from the audience. Throughout the Symposium, professional development opportunities abound with numerous parallel tracks, special sessions, and many occasions for networking. Abstract submission and registration for the Symposium are well



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underway at the MORS website. Also be sure to see Rochelle's article on page 25.

### Special Meetings

This past November, we conducted a 100 percent virtual training workshop on test and analysis techniques. Although we have conducted virtual events in the past, this was the first to do so along a somewhat traditional MORS special meeting model, with seven parallel tracks running continuously over two days. Congratulations and many thanks to meeting co-chairs Don Timian and Greg Hutto, and their entire team of instructors and support staff, for making this event a great success by any measure!

This month, we are seeing another first for MORS: a workshop that grew out of a Community of Practice (CoP) that grew out of a workshop that itself grew out of a previous special meeting. Allow me to explain. In September 2011, MORS held the workshop, "Risk, Trade Space & Analytics in Acquisition" to identify and share best practices for acquisition analysis. One significant conclusion from that workshop was that "affordability analysis" was poorly defined across the community. To address that shortcoming, MORS held a follow-on workshop entitled, "Affordability Analysis: How Do We Do It?" in October 2012. A chief finding from that workshop is that the topic is sufficiently complex and important to demand the establishment of a CoP that would meet regularly and build up the body of knowledge around affordability analysis. MORS

established the Affordability Analysis CoP in February 2013 under the leadership of Kirk Michealson, FS, and it quickly became both very active and very productive.

In fact, the Affordability CoP has been so productive that not only has it met monthly during the past year, but it has also produced a written summary of its work to date in the form of an "Affordability Research Document" (available on the MORS website) and has planned and executed a second follow-on workshop. This event, "Affordability Analysis: Developing the Process," is being held March 10–12, 2014 at the Lockheed Martin Global Vision Center in Crystal City, Arlington, Virginia. Also of note is the ongoing tie between the Affordability CoP and our annual Symposium's Composite Group E (Acquisition), Working Group 26 (Cost Analysis), and Working Group 27 (Decision Analysis).

The next exciting innovation in special meetings this year is a risk analysis workshop jointly sponsored by MORS and the Security Analysis and Risk Management Association (SARMA). Like MORS, SARMA is a nonprofit professional association. Unlike MORS, SARMA intentionally focuses on analyzing and managing security risks to complex systems from man-made threats. This partnership between MORS, with its broad mission to enhance national security analysis and advance the OR profession, and SARMA, with its specialized mission to provide risk analysis and policy advice to decision makers, brings together two strong and

complementary communities to work on an important problem.

Set for May 5–6 at the MITRE Campus in McLean, Virginia, MORS and SARMA will conduct the "Risk Analysis in the Logistics & Acquisition Supply Chain" workshop. Participants in this event will examine best practices for the significant analytic challenges in assessing risks within the supply chain. These topics are not new, but their importance continues to intensify as our move into the cyber and space domains continues to accelerate at a fantastic pace. Because of this, system and subsystem interdependencies and supply chain vulnerabilities have become harder to identify, quantify, and analyze.

The meeting leadership, including co-chairs Jim Muccio and Scott Berg, Bulldogs Jim Bexfield, FS, and Paul Byron Pattak, and Advisor Renee Carlucci, has developed an exciting and unique program. The workshop will focus on supply chain problems within three communities: homeland security, defense, and intelligence. This will be done in three parallel tracks, and at three different levels of classification: unclassified, secret, and top secret. Be sure to visit the MORS website for more information about the meeting structure and security requirements, and to register for the workshop.

The 11th Annual Education and Professional Development (EPD) Colloquium, to be held April 28–29, 2014 at the Virginia Military Institute in Lexington, Virginia, is perhaps our most ambitious EPD Colloquium

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ever. Thanks to CDR Harrison Schramm and his energetic team, we have an abundance of events, including the Rosenthal Competition, in which college students collaborate on a quick-turn analysis and have their presentations judged by a panel of national security analysis experts; a student poster competition, in which students are available to discuss their projects; a “speed mentoring session,” in which young analysts interact with senior analysts in a quick round-robin format; a young analyst panel to help address development needs of young professionals; a deployed analyst panel to learn from recent analytic experiences in Afghanistan and potentially other deployed locations; and a job fair to engage analysts and prospective employers. See the MORS website for more information and to register. Registration is free, but space is limited!

## MORS Local Chapters

Local chapters, including student chapters, have been around in concept for at least a decade. But the actual establishment and activity of such organizations has ebbed and flowed with the needs and ambitions of local communities. Ongoing travel restrictions have caused a renewed interest in such local MORS chapters for obvious reasons.

The MORS Rocky Mountain Chapter (RMC) was built over the past two years by a host of enthusiastic analysts, including Lee Lehmkuhl, Maj Travis Herbranson, Maj Ryan McGuire, 2nd Lt Romeo Le, and Katie Reece. The RMC meets regularly to share ideas and enhance

individual knowledge of all things related to OR and national security. The chapter’s goal is to provide a local venue that allows members to collaborate, recognize accomplishments within the MORS community, and provide mentorship for younger analysts. In addition to the RMC, analysts in Omaha, Nebraska, Orlando, Florida, and Washington, DC, are currently taking the early steps to establish local chapters.

As you can easily imagine, the composition and activities of any individual chapter will depend on the needs, ambitions, and energy of the local analysts. Of course, the reality is that without strong local leadership the chapters will not survive. The good news is that the MORS community has developed a strong cadre of potential chapter leadership over our 48-year history through the conduct of our regular activities.

Although the immediate impetus for a MORS local chapter might be to offset the hardship travel restrictions, the potential benefits are varied and many. Local chapters can recruit from all elements of the traditional MORS community, including military, civilian, academic, and industry. Furthermore, local chapters can often better seek out nontraditional or unique analysts and projects that might not attract attention at the national level, but are nonetheless very relevant at the local level.

It is important to understand that local chapters are not a collection of analysts who work together day-in and day-out in the same office. Although that kind of professional

development is important, successful local chapters incorporate a variety of nearby organizations into the chapter. For example, there may be major military and contractor organizations in an area (Orlando), or nearby academic institutions (Omaha), or a little bit of everything (Washington, DC). Such local institutions can provide chapter leaders with rich professional development options.

Local chapters can provide professional networking opportunities that produce relatively strong and enduring relationships simply because of physical proximity. And because local chapters maintain ties to the larger MORS community, those networking opportunities still have the potential for global reach. As mentioned, chapters can provide a good forum for mentoring, recognizing talent, and collaboration. One often overlooked benefit is the ability for local chapters to provide leadership opportunities for junior analysts who are often disproportionately affected by travel restrictions. As one of the RMC organizers, Maj Travis Herbranson, said, “Any way you slice it, it’s just a good idea!”

## Recognizing Achievement

I’m very happy to conclude this article by reporting that our Board of Directors met in early December and elected two new Fellows of the Society in recognition of their significant and long-term contributions to MORS. Please join me in congratulating Dr. Mark Gallagher and Dr. Niki Goerger on their selection to this life-time achievement! Mark and Niki will be formally installed as Fellows at our Symposium in June.

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We also elected Dr. Roger Burke to the MORS Board of Directors to fill the vacancy created when Tim Hope stepped down earlier in the fall. We congratulate Roger on his becoming our newest director, and we thank Tim for his years of service to MORS, and rest well knowing that there are many years of service yet to come.

As a final note, remember that this is your Society. Interested OR professionals like you continue to help our Society deal with ongoing significant challenges; for example, virtual does not completely replace in-person, and centrally located meetings are not always ideal. I encourage you to share your ideas and energy with your fellow profes-

sionals, as they do the same for you. Feel free to contact me, our CEO Susan Reardon, our Director of Member Services Liz Marriott, our Volunteer Coordinator Kirk Michealson, FS, or any of the members of our Board of Directors, to find an eager ear for your thoughts.

See you in June!



# MORS Salutes And Thanks Our 2014 Sustaining Contributors

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To become a sustaining contributor and make your tax deductible contribution to the Society today, contact Susan Reardon at 703-933-9075 or [susan@mors.org](mailto:susan@mors.org).

# MAS PRESIDENT

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**T**he new year is upon us and details on 2014 events can be found on our INFORMS and MAS community websites (<https://www.informs.org/Community/MAS>), but here is a quick summary of upcoming conferences:

- INFORMS Annual Meeting 2014, San Francisco, Sunday, November 9–Wednesday, November 12, at the Hilton San Francisco (<http://meetings2.informs.org/sanfrancisco2014>)
- Twentieth IFORS 2014, Barcelona, Spain, Sunday, July 13–Friday, July 18, at the Barcelona International Convention Center ([www.ifors2014.org](http://www.ifors2014.org))

Other ongoing efforts include developing support arrangements and collaborative partnerships with other organizations and agencies for future MAS conferences, workshops, and events (such as the Defense Strategies Institute, [www.dsigroup.org](http://www.dsigroup.org)), and collaborating with other professional societies (such as the Military Operations Society [MORS, [www.mors.org](http://www.mors.org)] and the International Society of Logistics [SOLE, [www.sole.org](http://www.sole.org)]) and institutes pursuing scientific research and applications. Please let us know your thoughts and ideas, and/or if you would like to contribute to these various initiatives.

Recently, I edited a special issue of the *International Journal of Operations Research and Information Systems* (IJORIS, Volume 4, Number 3, July–September 2013). Contributions to the special issue, “Modeling and Operations Research in Defense

Analysis,” were based on two sessions on the topic that the Military Applications Society hosted at the November 2010 INFORMS annual meeting in Austin, Texas. Five of our presenters’ papers are included in this special issue. These articles address operations research and mathematical modeling for decision-making issues in the government and military. They introduce models and analysis that deal with a wide variety of subjects from defense analysis.

In addition to my guest editors’ preface, the following articles from MAS members appear in the special issue:

- “Modeling and Methodology for Incorporating Existing Technologies to Produce Higher Probabilities to Detect Suicide Bombers,” by myself, John Binstock, and Mike Minutas;
- “Docking Two Models of Insurgency Growth,” by Michael Jaye and Robert Burks;
- “Modeling the Complexity of the Terrorism/Counter-Terrorism Struggle: Mathematics of the ‘Hearts and Minds,’” by Chris Arney, Zachary Silvis, Matthew Thielen, and Jeff Yao;
- “Performing Counter-High Energy Laser Evasive Tactics,” by Donald P. Gaver and Patricia A. Jacobs; and
- “Behavior Selection Using Utility-Based Reinforcement Learning in Irregular Warfare Simulation Models,” by Sotiris Papadopoulos, Francisco Baez, Jonathan Alt, and Christian Darken.

We received more submissions than the journal had room for, so IJORIS is

printing the following two additional papers in their next journal edition:

- “Numerical Solution for a Transient Temperature Distribution on a Finite Domain Due to a Dithering or Rotating Laser Beam,” by Tsuwei Tan and H. Zahn; and
- “A Network Approach to Identifying Military Fleet Replacement Strategies,” by Patrick J. Driscoll, Harry Newton, and Russell Mosier.

IJORIS is an excellent way for all of us in the operations research community to share the knowledge presented at our conferences. I encourage both MAS and MORS members to consider submission to it.

The continuing sequestration, budget, and travel issues promise to make 2014 an interesting year. We will not have a Spring 2014 MAS conference because of these restrictions. Let’s hope for some relief as the year progresses. Working diligently behind the scenes is a superb and responsive INFORMS administrative staff.

Most importantly, my sincere thanks to you all—our MAS membership, a remarkable group of professionals supporting our Nation on this unique cusp of history—for this opportunity and privilege—truly an honor—to serve. I am deeply grateful for your continued support and confidence throughout the journey. Keep up the great ideas and hard work.

See you in San Francisco.



# Education and Professional Development Colloquium

## Energizing Our Rising Members

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**T**his year's Military Operations Research Society Education and Professional Development Colloquium (MORS/EPD) will be held April 28–29 at the Virginia Military Institute, Lexington, Virginia. We're excited to partner with VMI this year. In addition to Lexington being a rich, historic, and beautiful town, VMI is hosting the colloquium in Marshall Hall's Center for Leadership & Ethics, a new facility and perfect venue. This year will be the 11th annual and best EPD yet.

Our keynote speaker this year is Mr. David Ochmanek, Deputy Assistant Secretary of Defense for Force Development. Mr. Ochmanek has had a

distinguished analytic career balanced between military service, government service, and academia. We are honored to have his participation. His full bio is available at <http://www.defense.gov/bios/biographydetail.aspx?biographyid=235>.

The EPD is for you if you are a student analyst (undergraduate), young analyst (early career), or mid-career young-at-heart analyst).

For the young analyst (undergraduate):

- **EPD is specifically targeted to you.** The EPD Colloquium is structured to energize and bring undergraduate students into the fold.

**The EPD is for you if you are a student analyst (undergraduate), young analyst (early career), or mid-career young-at-heart analyst.**



*USNA midshipmen participating in the Educational and Professional Development Colloquium*

Share your capstone coursework via presentation or poster session.

- **Young Analyst panel**, chaired by Angela Severe of Lockheed Martin, features professionals who are beginning their careers in operations research reflecting on the challenges and opportunities they face in their daily work.
- **OR Career Perspectives panel**, chaired by CDR Cory Culver of the Joint Staff, features those further along in their careers discussing how their OR backgrounds have affected both their OR and non-OR jobs.
- **The Rick Rosenthal Competition**, an EPD-only event chaired by Major Aaron Burciaga, is a “quick reaction analysis” competition. Students are randomly assigned to teams and given a challenging OR problem to collaborate on. Teams have five hours to apply OR methodologies to resolve the issues, demonstrate their skills, and develop a team solution. On the last day of EPD, teams present the results of their efforts to a judging panel in an open forum. The winning team receives a special recognition by MORS, and each member of the winning team receives an award.

**Registration is free, but space is limited. Visit [www.mors.org/EPD](http://www.mors.org/EPD).**

- **Speed mentoring**, which takes place during luncheons, introduces students and junior analysts to seasoned and senior analysts for brief mentoring sessions.
- **Afternoon sessions** feature practicing analysts discussing issues and opportunities pertaining to their fields.
- **A first-time job fair** will be held the evening of April 28. This event will be targeted at young analysts just starting their careers. Although not immediately applicable to service academy students, it will be interesting and beneficial for them to see what is out there as they develop their own career roadmaps.

If you're a young analyst (early career) or young-at-heart (mid-career) analyst, you can

- **Present** your analytic work or resume, and share insights from

your career.

- **Volunteer** to serve as a panelist or judge. If you are interested in serving in one of these capacities, please let us know at [epd@mors.org](mailto:epd@mors.org).
- **Dial in** to the “State of Navy’s Analytic Community,” a presentation by CDR Cory Dixon of the Navy’s Operations Analysis directorate (N81).
- **Learn** about and provide feedback on certification opportunities.
- **Attend the job fair.** This may be particularly useful for those at the “8–10 year crossroads.”

This year’s EPD will be an opportunity for all members of our community to build our future. By learning what young analysts are learning and thinking, we will be better able to energize new analysts and re-energize ourselves

Register soon! Registration is free, but space is limited. Be sure to visit us at [www.mors.org/EPD](http://www.mors.org/EPD) for updates and important information about travel, hotel recommendations, and registration.

Please email us at [epd@mors.org](mailto:epd@mors.org) with any questions about the event.

We look forward to seeing you at VMI! 🍷





# THE SECURITY OF PARTNERSHIP

In our increasingly interconnected world, the concept of global security has come to encompass a broad spectrum of challenges. Modern leaders look to companies with strong experience in advanced technology and wide-ranging capabilities to solve complex challenges. Our global team partners closely with our customers and approaches each mission and challenge as our own, whether we're supporting defense modernization programs, ensuring energy and economic security, protecting vital networks from cyber attack or launching satellites into orbit. We are problem solvers, applying rigorous operations research analysis practices towards all facets of our business and ensuring we answer the "why" before "what" or "how." When it comes to success in complex environments, we know partnerships make a world of difference.

*MORS-MAS Student Webinar Series:*

# Current Status and Future Plans

Julie A. Seton, Ph.D., Indelible Enterprises, LLC  
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Opportunities abound for students and newly graduated operations research (OR) analysts through MORS and INFORMS-MAS. Society members have easy access to information, jobs, and mentoring relationships through the student-centric webinar program. Any student, regardless of educational program, school, or interests, may dial into a live webinar with topics focused on OR.

The webinar series is an outreach mechanism for students to engage in OR professional societies, learn from OR experts, and connect with other members. It is an achievement borne out of a concerted effort by Dr. Niki Goerger, COL Simon Goerger (USA Ret.), and CDR Walt DeGrange (USN) to bring the two organizations together for common benefit. Dr. Julie Seton and CDR DeGrange lead the webinar productions for MORS and MAS, respectively. This article summarizes the webinar series—what has been done, what is available on the website, and what is planned for the coming year.

To date, seven webinar events and one analyst panel discussion have been conducted under this program, with more than 100 attendees for the live events and an unknown number of additional offline attendees who have viewed the recorded sessions. We have experimented with different formats (Microsoft PowerPoint, Adobe PDF, and live Internet), the number of presenters per session (ranging from a single speaker to four speakers in a session), different webinar software programs (Go-To-Meeting™ by Citrix, WebEx™ by Cisco, and Google Hang-Out™ Google), and length of presentation (ranging from 5 to 60 minutes).

Interaction and discussion with the audience have occurred via telephone, email, live text chat, and live Voice over Internet Protocol (VoIP). Attendees have been able to participate individually via telephone or computer, or in small groups gathered around a single speakerphone or computer. Each webinar topic was selected by the planning team for its value in the following professional sectors: academia, defense, government (nonmili-

tary), large industry, small business, and nonprofit. Table 1 lists the session titles, the dates they were held, and speakers. Speakers have come from a range of professional expertise and all have had experience in more than one professional sector, giving the program a breadth that is valuable to student and professional analysts alike. Table 2 (page 12) lists speakers (alphabetically by last name), their presentation titles, and the professional sectors in which they are active. Readers can use this information to identify mentors and advisors, and to expand their professional networks.

Recorded sessions are accessible to members of MORS and MAS at the Web addresses below:

- <http://www.mors.org/events/studentwebinars.aspx>
- <http://www.youtube.com/user/WatchMORS/videos>
- <https://www.informs.org/Community/MAS/MORS-MAS-Joint-Student-Member-Info>

Table 1. MORS-MAS webinars held in 2012–2013.

Date	Webinar titles and speakers	Speakers
July 20, 2012	Introduction to MORS-MAS Student Membership Bundling	Dr. Julie Seton and CDR Walt DeGrange
	Overview of Department of Defense Opportunities for OR Analysts	Dr. Jim Morris
	Overview of Academic Research Opportunities for OR Analysts	Dr. Daniel Behringer
September 21, 2012	Prize Winners In Operations Research: Experiences and Perspectives	Dr. Jim Morris and Major Brady Vaira (USAF)
November 30, 2012	How Does Industry Use OR to Support the Military?	Mr. Jack Levis and Mr. Norm Reitter
January 18, 2013	Strategies for Public Speaking: Setting Considerations	Dr. Julie Seton
March 29, 2013	A Medley of Military Problems	Dr. Alexandra Newman
April 17, 2013	MORS EPD Colloquium Young Analyst Panel	
August 9, 2013	Mentorship and Online Networking	Mr. Dennis Baer and CDR Walt DeGrange
September 20, 2013	Why and How to Get Published	CDR Harrison Schramm, Dr. Richard Deckro, and Ms. Lynda Liptak

# Contributing to *Phalanx*

*Phalanx* is the magazine of MORS and MAS, providing readers information on the societies' events, professional information and updates, and news that directly relates to your career as an operations analyst in the field of national defense. We're looking for contributions to the magazine in the following areas:

- Articles (up to 3,000 words) on professional techniques and processes that have been used in practice
- Commentary on past articles in the magazine or on professional issues important to our members
- Updates on our members' professional activities — what you're working on, and your accomplishments

*Phalanx* reaches the leaders of the national security analytic community in government, industry, and academia and provides a unique forum for analysts to share and learn. Use *Phalanx* to share your work, your ideas, and your achievements. Submissions to *Phalanx* can be made to [phalanx@mors.org](mailto:phalanx@mors.org).

Table 2. Speakers, titles, and professional sectors.

Speakers (listed alphabetically) / Professional sector	Presentation titles	Academia	Military	Small business	Large business	Government (nonmilitary)	Nonprofit
Mr. Dennis Baer (FS) US Navy	Mentoring Is...		X	X	X		X
Dr. Dan Behringer Argonne National Laboratory	Overview of Academic Research Opportunities for OR Analysts	X	X			X	
Dr. Dick Deckro (FS) Air Force Institute of Technology	Pointers on Getting Published	X	X				X
CDR Walt DeGrange US Navy / Naval Postgraduate School / MAS	An Introduction to Operations Research Professional Organizations Online Networking	X	X				X
Mr. Jack Levis UPS / INFORMS	INFORMS and Analytics				X		X
Ms. Lynda Liptak Applied Research Associates	Publishing With MORS		X	X	X	X	X
Dr. Jim Morris US Air Force	Operations Research in the Federal Government and Armed Forces: OR in the service of our country  Prize Winners In Operations Research: Experiences and Perspectives	X	X				
Dr. Alexandra Newman Colorado School of Mines	A Medley of Military Problems	X	X				
Mr. Norm Reitter Reitter Consulting	How Does Industry Use OR to Support the Military?		X	X		X	X
CDR Harrison Schramm US Navy	Presentations and Publishing	X	X				X
Dr. Julie Seton Indelible Enterprises	Military Operations Research Society Overview  Public Presentation Strategies Based on Setting	X	X	X		X	X
Major Brady Vaira US Air Force	Prize Winners In Operations Research: Experiences and Perspectives	X	X				

## Plans for 2014

Moving into 2014, the webinar program is managed by the Education and Professional Development Committee under CDR Harrison Schramm. The focus will shift to include junior analysts as well as students. The MORS Junior Analyst program is now formalized under the capable hands of Ms. Angela Severe, with guidance from MORS Membership Chair, Mr. Norm Reitter. The planning committee will expand to include at least one student and one junior analyst. We are happy to have any *Phalanx* reader contact any of us to volunteer as a planner, a speaker, or an idea generator.

Potential topics currently under consideration include:

- Internship opportunities
- Getting involved with MORS Communities of Practice
- Abstract writing for conferences
- “Must read” list for OR analysts
- Preview of the MORS Education and Professional Development Colloquium
- Do’s and don’ts of poster presentations
- Shifting military focus: OR techniques to address redeployment of forces overseas
- Presentation preparation/rehearsals for MORSS
- Comparing prizes and awards: What are they? How do I get nominated?

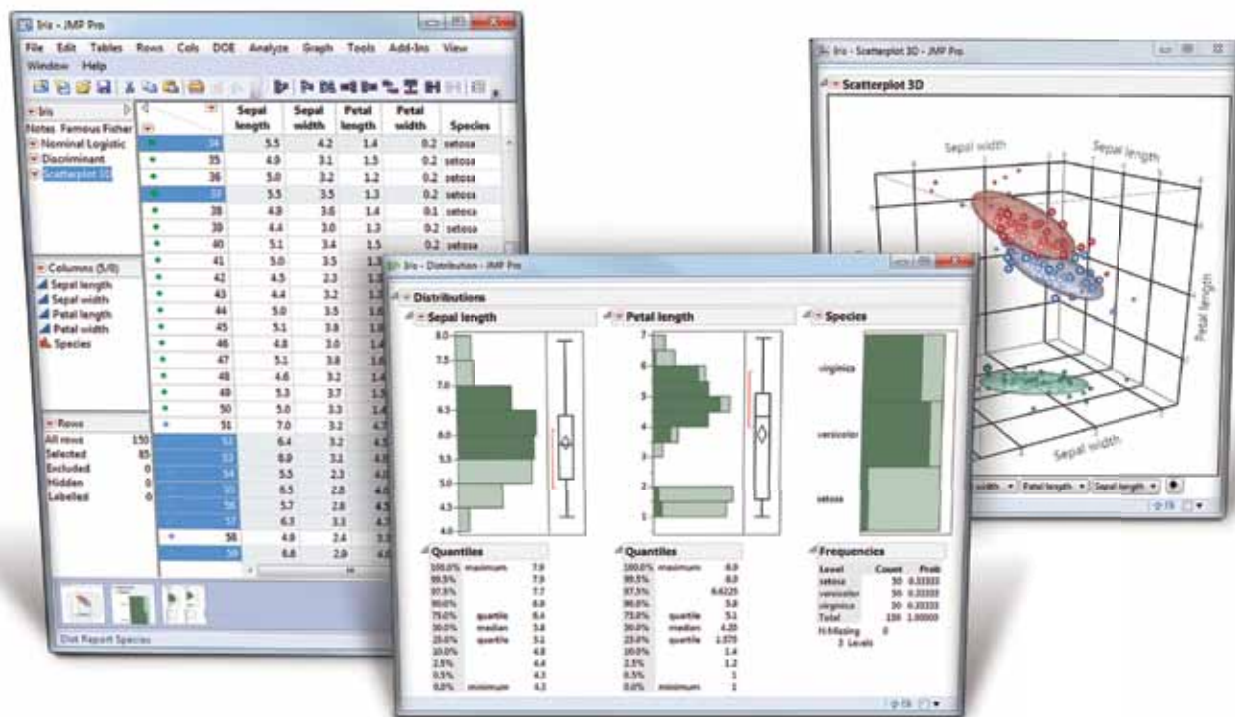
Look for specific announcements regarding topics, speakers, call-in numbers, and URLs that will come out about two weeks before each session.

## Conclusion

The MORS-MAS student webinar series has provided a wealth of information to our combined Societies. The recorded versions of these sessions are found on the MORS and MAS websites and are available to members.

You know students and analysts who might benefit from the existing sessions. Suggest they become members so they can benefit from the expertise and knowledge available online. You also know students and analysts who will benefit from listening to or presenting their work on the prospective topics in upcoming webinars. Suggest they contact the MORS office or Dr. Julie Seton to schedule their participation. Hope you can join us for a session or two. 🌐





# EXPLORE

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# MORS 2014 INDUSTRY DAY

## Building Government and Industry Relations

Mr. Dennis Baer, FS, and Ms. Jennifer Ferat, [jennifer@mors.org](mailto:jennifer@mors.org)

**T**he Second Annual MORS Industry Day will be held March 13, 2014 at the Crystal City Hilton in Alexandria, Virginia. Our theme “Building Government and Industry Relations” will bring together senior keynote speakers and panel members from both government and industry.

The morning session will feature two keynote speakers: Mr. Bryan Harris, Director of Research and Development for Cyber Analytics at SAS, and a senior representative from Lockheed Martin. The panel, moderated by MORS President-Elect, Dr. Rafael E. Matos, WBB, Inc., will consist of government and industry senior members. Both sessions will address

the challenges and opportunities of managing “Big Data” in the national security environment.

The lunch session will feature a showcase with exhibitors that will include small businesses as well as large organizations and institutions. This will be a great opportunity to network and discuss the morning sessions with your government or industry counterparts.

The afternoon sessions will begin with a keynote by Dr. Forrest Crain, Director, Center for Army Analysis, followed by another mixture of government and industry experts moderated by Dr. Tom Allen, FS, from the Joint Staff (J8). These two events will focus on how the government and industry can work together to more effectively identify and use informa-

tion and present it to the senior leadership, in order to produce better-informed actionable decisions.

The event will conclude with a MORS-hosted (hors d'oeuvres and a cash bar) networking event to discuss the afternoon sessions and continue to build the government and industry relations from the morning and lunch sessions. The event registration is free of charge to participants with a nominal charge for lunch.

More information on registration can be found at <http://www.mors.org/events/industry-showcase-2013.aspx>. For more information on becoming an Industry or Institutional Exhibitor or Partner, please go to [www.mors.org/iip/](http://www.mors.org/iip/).



# Affordability Analysis From “How Do We Do It?” Workshop To “Developing the Process” CoP Meeting

Kirk Michealson, FS, [kirk.michealson@1979.usna.com](mailto:kirk.michealson@1979.usna.com)

In the “Communities of Practice: Keeping the Analytical Momentum Going Year ‘Round” article from the December 2013 issue of *Phalanx*, Steve Nortarnicola, MORS Communities of Practice (CoP) committee chair, mentioned that MORS CoPs were established and organized for various reasons, from sharing best practices to working on professional projects. The Affordability Analysis CoP, which was formed as a result of the MORS “Affordability Analysis: How Do We Do It?” workshop, is tied to MORS Symposium Composite and Working Groups. It developed the Affordability Research Document for government and industry, and is planning a follow-on special meeting entitled, “Affordability Analysis: Developing the Process,” to continue the recommendations from the initial Affordability Analysis workshop.

## Formation

In discussions in the Development Planning (DP) working group at the September 2011 MORS Special Meeting on “Risk, Trade Space, and Analytics in Acquisition,” participants discovered that affordability analysis was ill-defined. That is, for those organizations that defined it, there is not a consistent definition for affordability analysis across the Department of Defense. The working group recommended developing and formalizing affordability analysis

processes, including recognizing the difference between cost and affordability analyses. They also noted that affordability analysis should include mission-based, portfolio-based, and capability-based analyses.

As a result of these recommendations, MORS led a workshop on “Affordability Analysis: How Do We Do It?” in October 2012 to determine the state of the practice of affordability analysis. The executive summary appeared in the December 2012 issue of *Phalanx*, and the final report with other information from the workshop is posted on the MORS Affordability Analysis workshop webpage (<http://www.mors.org/events/2012aa.aspx>). The workshop recommended the following next steps:

- Form a team to continue working on affordability analysis.
- Complete the research not conducted during the 3 ½-day workshop.
- Develop an affordability analysis “how-to” manual/guidebook/process.
- Pilot the manual/guidebook/process on a couple of projects.

The first next step was completed when the Affordability Analysis (AA) CoP was established in February 2013 to continue working on the recommendations from the Affordability

Analysis workshop. Kirk Michealson, FS, the Affordability Analysis workshop chair, continued as the AA CoP chair and many of the current CoP members from across government, industry, federally funded research and development centers (FFRDCs), and university-affiliated research centers (UARCs) participated in the Affordability Analysis workshop.

The AA CoP is organized into various groups, depending on function:

- **Leadership group:** These are service representatives from the Air Force, Army, and Marine Corps who have worked on this topic in the MORS Acquisition and Affordability Analysis Special Meetings. Their function is to participate in the AA CoP and confer with the chair on CoP leadership decisions. The AA CoP is soliciting a Navy representative. If interested, please contact Kirk Michealson, FS.
- **Product development group:** This group works on the recommendations from the Affordability Analysis workshop and develops products for review.
- **Review groups:** These are several groups that review the products created and provide comments and recommendations to the AA CoP chair:
  - o **Core team:** These are CoP members from across govern-

ment, industry, and UARCs that review the products from their organizations' perspective and provide comments.

- o **COCOMS:** Recently added, several combatant commanders (COCOMS) have provided representatives to review the CoP products from their perspective.
- o **Industry marketing partners:** During the Affordability Analysis workshop, several professional organizations joined MORS and have stayed involved in the AA CoP to review products from their organizations' perspective. These organizations are the National Defense Industrial Association Systems Engineering (NDIA SE) Division, the International Council for Systems Engineering (INCOSE), and the International Cost and Estimation Analysis Association (ICEAA).
- o **Proponents:** Through representatives from the Office of Secretary of Defense for Acquisition, Technology & Logistics, the Assistant Secretary of Defense for Acquisition was the Affordability Analysis workshop proponent. Based on the results and outbriefs, both offices have stayed involved with the AA CoP as proponents. In addition, based on discussions during the J8 Leadership Outbrief, the Joint Staff/J8 has also joined as a proponent.

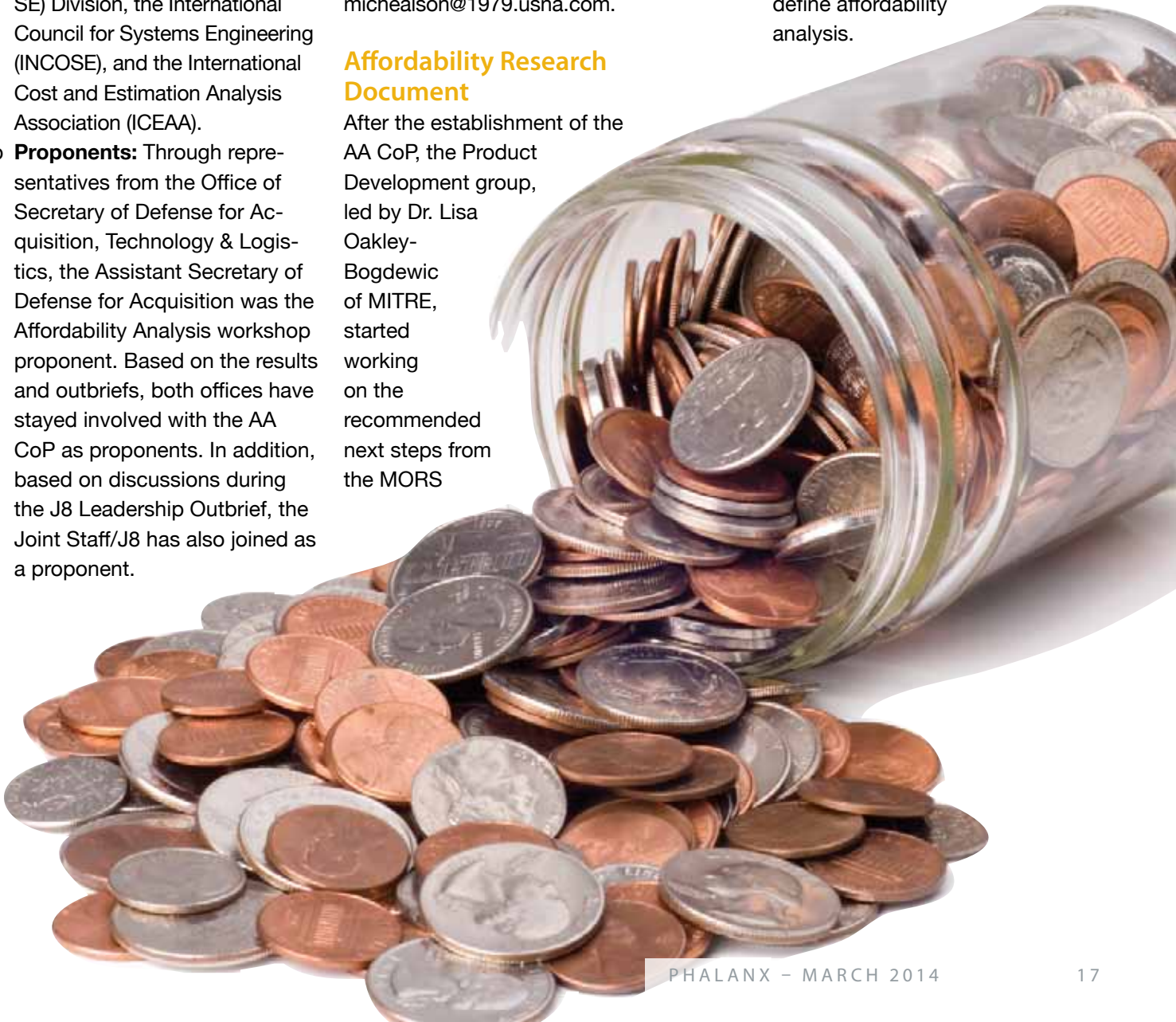
Through discussions with the MORS Symposium chairs, the Affordability Analysis CoP chair has established ties with the Acquisition composite group (CG E), the Cost Analysis working group (WG 25), and the Decision Analysis working group (WG 26), conducting joint sessions with them at past Symposia. Between Symposia, the AA CoP meets virtually the first Wednesday of each month from 1200–1300 ET via the MORS telecom number. For more information on the Affordability Analysis CoP, please visit the MORS website at <http://www.mors.org/events/affordability-analysis.aspx>. The AA CoP is always looking for new members. If you are interested, please contact Kirk Michealson, FS, at [kirk.michealson@1979.usna.com](mailto:kirk.michealson@1979.usna.com).

### Affordability Research Document

After the establishment of the AA CoP, the Product Development group, led by Dr. Lisa Oakley-Bogdewic of MITRE, started working on the recommended next steps from the MORS

Affordability Analysis workshop. Assisting Lisa were Bob Koury, Price Systems (MORS Secretary); Steve Notarnicola, Lockheed Martin Center for Innovation (MORS CoP Committee Chair); Rick Null, Lockheed Martin Aeronautics; and David Schumann, SAS. As the AA CoP started working, the AA CoP Leadership and Product Development teams realized that:

- **No organization** owns affordability analysis,
- **Every organization** wants to know what every other organization is doing in the area of affordability analysis, and
- **Every organization** likes that MORS is leading the effort to define affordability analysis.



For the second next step, during the workshop and leadership outbriefs, several recommendations were made for additional research. The AA CoP Product Development team created the Affordability Research Document (ARD), which all review groups have reviewed. The living document is posted on the AA CoP webpage (<http://www.mors.org/events/affordability-analysis.aspx>).

The ARD organizes the additional research into the following sections:

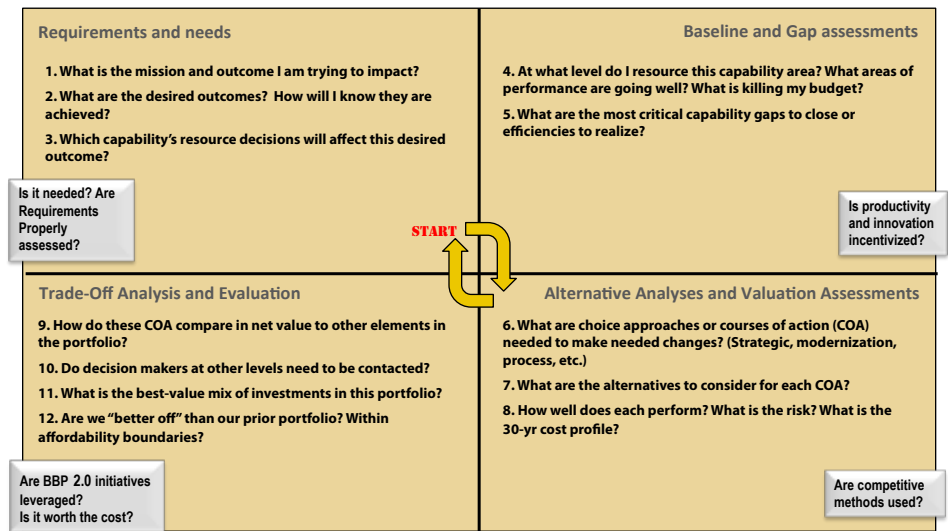
- Introduction: The Affordability Analysis CoP Challenge
- Decisions Supported by Affordability Analysis at Different Levels
- Exit Criteria: Sufficiency and Quality
- A Framework for an Affordability Analysis “How To” Manual
- Recommended Next Steps
- Appendices: Acronyms, ARD References, Other Affordability-Related Key References, and Visualization Ideas

Section 4.0 of the ARD discusses the statement, “every affordability analysis, at any organizational or scope level, must have the proper scope, address requirements assess the related baseline, relay gaps, and duplications, assess courses of action for change, and evaluate the relative benefits and costs of the alternatives in question. It must coordinate with portfolios in the ‘same level’ tradespace, as well as with those in adjoining levels. The affordability analysis must leverage the institutional data and process artifacts and be conducted in accordance with the standard resource management flow of the organization. It must present results tailored to the decision needs of the end user.”

As the research was organized, a framework emerged (see Figure 1). The ARD proposes “a twelve-step

## Figure 1. Affordability Analysis 12-Step Framework

### Twelve Step Framework in 4 Phases with Driving Questions and “Vital” Questions



framework that incorporates end-to-end resource management ideals and provides a structure for affordability questions and objectives to shape the buy-ability of desired capabilities. Within different phases of the framework, key ‘vital’ questions must be asked at all times and be evident in any affordability product.”

“The twelve steps outline a framework that should be conducted at an organizational and portfolio level appropriate for the decision at hand, and right-sized for the efficiencies or mission benefits anticipated. If decisions at one organizational level impact those at another level, these must be accounted for in the assumptions and data used. Organizations that have active portfolio management processes will be able to leverage their data and products to support affordability. All Affordability Analyses should answer or find answers to these twelve general questions: if one does not need to conduct assessments to answer a question, then there should be an answer available—the question is still relevant.”

### “How-To” Manual

With the second recommended next

step completed—i.e., the Affordability Research Document—the AA CoP started to plan how to develop an affordability analysis “how-to” manual/guidebook/process. Based on previous work, the AA CoP chair decided to conduct a combined MORS Special Meeting with a Lean Six Sigma Value Stream Mapping event to develop the initial process.

The AA CoP meeting on Affordability Analysis: Developing the Process is scheduled for March 10–12, 2014 at Lockheed Martin’s Global Vision Center, 2121 Crystal Drive, Arlington, VA 22202. Kirk Michealson, FS, the AA CoP chair, and Dr. Lisa Oakly-Bogdeic, AA CoP Product Development lead, will co-chair the meeting. The overall goal of the Affordability Analysis CoP is not to develop a prescriptive, “one-size-fits-all” “how-to” document or a manual on doing optimal resource allocations, but to develop an affordability analysis process with best practices, lessons learned, considerations, etc., as well as including ties to the individual Service’s new affordability policies.

Using the Affordability Analysis workshop final report, the Affordability

**DEFINITION:** *A Lean Six Sigma Value Stream transforms information into a final product/service for delivery to the customer. The value stream is all activities that provide value or are required, but doesn't include the non-value added activities. The goal of a Lean Six Sigma Value Stream Mapping event is to identify these value-added and required activities and then map these activities into an organized process.*

Analysis CoP Affordability Research Document, and other background material, this “Affordability Analysis: Developing the Process” meeting will continue the work of the Affordability Analysis workshop and CoP and be organized into four working groups with a synthesis group. The four working groups will be aligned with the four phases of the 12-step framework:

- WG 1: Requirements and Needs
- WG 2: Baseline and Gap Assessments
- WG 3: Alternative Analyses and Valuation Assessments
- WG 4: Trade-Off Analysis and Evaluation

This AA CoP meeting will be a combined MORS Special Meeting and a Lean Six Sigma (LSS) event (see Table 1). With the facilitation leadership of LSS Black Belts and Green Belts, each of the four MORS working groups listed will conduct a Lean Six Sigma value stream map (VSM) for their respective affordability analysis phase from the ARD's 12-step framework.

Unlike other MORS Special Meetings, the final products from this MORS AA CoP meeting will be separate VSMs for each of the affordability analysis phase working groups, with associated input-output charts. The Affordability Analysis CoP will use the

Get to Excellence (Action) plan that will also be created in the meeting to transform the 4 WG VSMs into the affordability analysis “how-to” manual/guidebook/process.

To accomplish this, the “Affordability Analysis: Developing the Process” meeting will be conducted as follows:

- Monday afternoon, March 10: Workshop kick-off/plenary session. From 1300 to 1700, a series of foundation briefs will be presented. These will include the Affordability Analysis workshop outbrief, an overview of the ARD, an update of the affordability analysis definitions, and an overview of the goals of the workshop. Then the attendees will break into their working

groups for introductions and learn about their assigned phase.

- Tuesday, March 11: The attendees will meet in their assigned working groups and start developing their phase VSM, ending the day with an input-output chart for their phase. The input-output charts will be distributed to all working groups during the end-of-day leadership/integration meeting.
- Wednesday, March 12: In the morning, the working groups will recommence reviewing the other phase working group input-output charts, and will then complete their phase VSMs and Get to Excellence (Action) plans. The daily leadership/integration meeting will be held during a working lunch to provide a last situational

**Table 1. Comparing a MORS Special Meeting with a Lean Six Sigma Event**

Item	MORS	LSS Value Stream Map
Daily meetings	Integration meetings	Management meetings
Description documents	Concept paper/TOR	Charter
Discussion facilitation	If needed, WG chairs	Black belts and green belts
Meeting product(s)	Final report	Value stream map and Get to Excellence plan
Overview briefings	Tutorials	Background plenary
Synthesis	Synthesis group	Project lead post-event
Topic discussions	Working groups	Affordability phase teams
Working group attendees	Working group members	Team members
Working group leadership	Chair	Team leader

awareness across all working groups. In the afternoon, each phase working group and the synthesis group will provide their respective outbriefs.

### Summary

There are strong linkages across all aspects of MORS for affordability analysis: It was recommended by the September 2011 Acquisition Special Meeting, the AA CoP was recommended by the MORS Affordability Analysis workshop, the AA CoP is tied to MORS Symposium composite and working groups (CG E, WG 25, and WG 26), and the AA CoP is leading the March 10–12, 2014 “Affordability Analysis: Developing the Process”

MORS meeting. From Steve Notaricola’s (MORS CoP committee chair) article on CoPs in the December 2013 *Phalanx*, the Affordability Analysis CoP is active in all recommended areas:

- Meet throughout the year on a specific topic: Meets monthly for affordability analysis.
- Continue discussions from the Symposium or Special Meeting: Formed to work the recommended next steps from the October 2012 affordability analysis workshop; and tied to the Acquisition composite group (CG E), Cost Analysis working group (WG 25), and Decision Analysis working group (WG 26).
- Share best practices: Will be

incorporated into the affordability analysis “how-to” manual/guidebook/process.

- Work on professional projects: The ARD and the upcoming affordability analysis “how-to” manual/guidebook/process.

The Affordability Analysis Community of Practice is an active MORS CoP providing value to MORS customers. If you are interested in knowing more about the AA CoP, please visit <http://www.mors.org/events/affordability-analysis.aspx>. If you are interested in joining, please contact the AA CoP Chair, Kirk Michealson FS at [kirk.michealson@1979.usna.com](mailto:kirk.michealson@1979.usna.com).



# Test and Analysis Techniques Training Workshop

Donald Timian, US Army Test and Evaluation Command, donald.h.timian.civ@mail.mil; and Greg Hutto, US Air Force Materiel Command, 46th Test Wing, gregory.hutto@us.af.mil

**O**n November 18–19, 2013, to an audience of 132 testers and analysts, MORS conducted its first virtual Defense Connect Online (DCO) Training Workshop.

Taught by recognized experts in the field, classes on relevant topics such as design of experiments (DoE), Bayesian analysis methods, and computing statistical power, formed the core of the workshop's 30 tutorials.

Two lunch panels were also conducted using DCO. On Monday, November 18, "Department of Defense Perspective on DoE and Analysis Techniques Practice, Policy, and Guidance" was presented, followed on Tuesday, November 19, by "Service Perspectives on DoE and Analysis Techniques Experiences, Policy, and Organization."

Dr. Bram Lillard, Acting Science Advisor, Office of the Secretary of Defense Director Operational Test and Evaluation (DOT&E), and Dr. Darryl Ahner, Director, Deputy Assistant Secretary, Defense for Developmental Test and Evaluation's (DASD(DT&E)) Scientific Test and Analysis Techniques (STAT) Center of Excellence (COE), were the lunch panelists on Monday. Key items discussed included the need for relevant, credible evidence to decision makers as driving factors for requiring DoE at both DOT&E and DASD(DT&E); examples of flawed DoE application in operational testing; and a short description of the DASD(DT&E), DOT&E, and Service Test and Evaluation (T&E) Executives signed scientific test and analysis techniques (STAT T&E) policy and its associated implementation plan.

Lt Col Shane Dougherty (Air Force), Mr. Paul Johnson (Marine Corp), Dr. Bob McIntyre (Navy), and Mr. Don Timian (Army) were the Service speakers on the Tuesday. Key topics discussed included the Air Force's DoE training program; the Marine Corps Operational Test Activity's use of DoE and its experiences and lessons learned to date; the Navy's 12-step integrated evaluation framework/mission-based test design process and how DoE fits into step 9, "Statistical Design"; and the Army's efforts to use DoE by program managers to find cost savings while improving the Army T&E statistical rigor.

## Schedule

Figure 1 shows the schedule for the workshop. Most of these classes will

**Figure 1. Workshop schedule. Most of these classes will be placed on the MORS website for members to access at their leisure.**

Monday 18 Nov 2013			Tuesday 19 Nov 2013		
Morning	Engineer intro to DEO Green Belt 1 of 4	[A]	Engineer intro to DEO Green Belt 1 of 4	[A]	
	Replacing Binomial Resp. with Censored Continuous Response	[D]	Huntsville Cases: Aircraft and Systems	[A]	
	Reliability Growth and Test Planning (Continuous)	[D]	Reliability Growth and Test Planning (Discrete)	[D]	
	Questionnaire and Rating Scales Design in T&E	[B]	Questionnaire and Rating Scales Analysis in T&E	[B]	
	Fractional, Min Abberation and Optimal Designs	[D]	Re-Engineering Existing Designs w/DEO	[B]	
	1.5 Hour Leading Change for Senior Leaders & Execs	[C]	Pickatenny Cases: Ammunition and Projectiles	[A]	
	Nonnormal Response Analysis: Gen Linear Model 1/2	[D]	Nonnormal Response Analysis: Gen Linear Model 2/2	[D]	
Lunch	OSD Panel (DDT&E - DOT&E) - Practice, Policy, Guidance	[E]	Services T&E Panel - Experience, Policy, Organization	[E]	
Afternoon	Engineer intro to DOE Green Belt 2 of 4	[A]	Engineer intro to DOE Green Belt 4 of 4	[A]	
	Introduction to R and R Packages	[A]	Bayesian Analysis Methods - Basic	[A]	
	Designs With Order Restrictions - Split Plots	[D]	Design and Analysis of Computer Experiments	[A]	
	Empirical Models, Observational Studies, Quasi Exp Designs	[B]	Reliability Data Analysis with Censored Data	[D]	
	Computing Statistical Power - Normal and Binary Responses	[D]	Developing a DT&E Evaluation Framework	[B]	
	Design for Software-intensive Systems 1 of 2	[B]	Design for Software - Intensive Systems 2 of 2	[B]	
	Tutorial Lessons - Policy, Guidance, Training, Education	[E]	Tutorial Lessons - Best Practices and Organization	[E]	

be placed on the MORS website for members to view at their leisure.

### Takeaways: Test and Analysis Techniques

Although classical design and analysis of experiments apply unalloyed to a great deal of Department of Defense (DoD) test and analysis endeavors, there is a rich field of research and a trove of advanced techniques available for more sophisticated treatment of unusual processes and data sets. Furthermore, the DoD is blessed with an exceptional array of gifted instructors in these techniques, able to impart new skills to the test and analysis workforce.

To recap some of the highlights of the 28 technical tutorials and four organizational and policy discussions, we offer the following summaries.

#### ***“Advanced Techniques Available—Inquire Within”***

- Replacing binomial (yes-no or success-failure) response variables with rich, continuous, valued metrics can result in both tighter confidence intervals and smaller required sample sizes. Applications include munitions test (replacing hit-miss with miss distance) and sensor testing (replacing detect-no detect with

detection range or time).

- Design and analysis approaches for deterministic software-intensive system tests can yield highly efficient test run matrices when testing software products for functionality. Applications include mission planning software, enterprise logistics Web applications, and data link communications.
- Methods for reliability growth planning and reliability and life analysis help ensure fielded systems can be supported and maintained in mission-ready status in field use, saving our operating commands massive amounts in operations and maintenance funds.



- Methods for design and analysis of surveys, questionnaires, and other subjective-response problems address cases in which expert opinion is a vital part of judging system effectiveness. Problems such as system usability, operator workload, and uniform or equipment fit and comfort, often rely on survey methods for measuring effectiveness.
- Generalized linear models (GLM) find application in cases in which responses are binary counts of rare events, comprise skewed and heavy-tailed distributions, and other nonnormal theory cases. Applications benefiting from GLM may comprise as much as 10–20 percent of military test and evaluation.
- Bayesian methods allow testers to incorporate common-sense prior information and straight probabilistic likelihood interpretations of resulting analyses.
- The world of split plot design and analysis is suited to cases in which certain test conditions are inconvenient, inefficient, or impossible to randomize, such as day-night, vehicle altitude or depth, changes in hardware configuration, or weather changes. Increasingly, research material, teaching methods, and software make applying split plot techniques in reach of the practitioner.
- On occasion, one must analyze existing data sets without the benefits of being in control of test conditions. Approaches and suitable cautions and caveats were illustrated when analyzing nondesigned data sets—empirical modeling, quasi-experimental designs, historical analyses, and observational studies.
- Instructors addressed (and supplied spreadsheets for implementing) how to compute statistical power when normal theory assumptions are clearly untenable—binary responses, count or rating scale responses.



## ***“Organizational Change: Making Science of Test ‘The Way We Do It Around Here’”***

- One of the most difficult human endeavors is making fundamental change to organizations and behavior. Years of effort, extraordinary leadership, and thorough training, empowerment, accountability, and equipping are needed to make change endure.
- Suitable training is needed at all levels of command: senior executives, middle management, team leads, operators, and analysts and engineers. Training is available through various means: Air Force Institute of Technology's T&E Graduate Certificate Program; STAT Center of Excellence short courses; US Army Materiel Systems Analysis Activity short courses on reliability growth and analysis; Eglin Air Force Base, Florida, short courses; and vetted, high-quality commercial short courses. For details on available training, contact Dr. Darryl Ahner (Director STAT COE, [darryl.ahner@us.af.mil](mailto:darryl.ahner@us.af.mil)) or Mr. Greg Hutto (gregory.hutto@us.af.mil).
- A number of policy initiatives are underway in both DOT&E and DASD(DT&E), including Interim DoD Instruction 5000.02, “Operations of the Defense Acquisition System,” dated November 25, 2013, the Defense Acquisition Guidebook, and the Test and Evaluation Master Plan Guidelines. Policy focuses on the goal of well-designed experiments, not in mandating methods.
- Case studies abound—at

DOT&E's extranet ([www.dote.osd.mil](http://www.dote.osd.mil)), in National Defense Industrial Association and International Test and Evaluation Association publications, at the US Air Force DoE SharePoint (<https://cs3.eis.af.mil/sites/OO-TE-MC-79/default.aspx>), and at this workshop. Contact Mr. Greg Hutto ([gregory.hutto@us.af.mil](mailto:gregory.hutto@us.af.mil)) or Mr. Don Timian ([donald.h.timian.civ@mail.mil](mailto:donald.h.timian.civ@mail.mil)) for details.

- Experience shows that a few key hires, well-educated and experienced in experimental design and analysis, accompanied by growing practitioners from within, works well in many organizations.
- Organizing analysts into a core group and matrixing them to line projects allows both the dynamic flexibility needed by test and analysis shops, and a critical mass for rapid mentoring and seasoning.

### **Key Lessons Learned: Virtual Workshops**

Given today's fiscal environment, “virtual” training and meetings will become more frequent. For this reason, some of the “lessons learned” from the online workshop are worth noting.

### **Meeting Preparation**

1. Decide on the scope of the meeting's virtual component early. Virtual participants need to be familiar with the collaborative technology utilized, in this case DCO. Expert users are needed to provide participants and/or speakers with technical help.
2. Notification of the virtual event must be out at least 30–60 days prior to the event.

3. Speakers/instructors in a virtual environment must be prepared. Most in this workshop seemed comfortable with talking to a virtual audience.
4. If recording, ensure that participants are prepared to start and stop the recording.
5. Suggest that interested individuals participate from a quiet or remote location away from work. Several people should reserve a conference room and take the class together. This could help limit workplace distractions.
6. Monday is a hard day on collaborative services. If possible, start on a Tuesday or later in the week.
7. Give students an early “check-in time” to eliminate machine or browser issues.
8. Have participants sign up for classes they plan to attend and give the instructors a rough number of how many to expect. This will help instructors know when they have a quorum and can start.
9. Test all systems well before starting the meeting. Have a phone back up to VoIP.
10. Use a secure collaborative system if you want to restrict attendance. DCO rooms are not “secure”; anyone who has the URL can attend.
11. It is good to see who is talking, and streaming video of the speaker is valuable.
12. Seek and encourage participant feedback during the presentation, by, for example, posting questions to the chat window and having the presenter cover them when possible. Virtual silence is more deafening than real silence. 🌐

# Update on the 82nd MORS Symposium

## Guiding the Nation through Uncertain Times

Rochelle Anderson, US Army TRAC, rochelle.a.anderson.civ@mail.mil

Planning continues for the next MORS Symposium, to be held virtually June 4–6, 2014, and in-person at the Hilton Alexandria Mark Center in Alexandria, Virginia, June 16–19, 2014. The theme, “Guiding the Nation through Uncertain Times,” reflects the role of operations research analysis within the defense community as our leaders grapple with difficult decisions in an austere fiscal environment. The symposium team is hard at work planning the composite and working groups (CG/WG), special sessions, tutorials, demonstrations, posters, plenary session, and other details specific to the 82nd MORSS.

Mrs. Katrina McFarland, Assistant Secretary of Defense (Acquisition), will be the plenary session keynote speaker for the 82nd Symposium. Mrs. McFarland is the principal advisor to the Secretary of Defense and the Under Secretary of Defense for Acquisition, Technology, and Logistics on matters relating to acquisition. You can learn more about her by reading her biography, also published in this edition of *Phalanx*.

We have a great program planned for the participants of this year’s symposium, beginning with analytic briefings from across the Department of Defense analysis community and includ-

ing, for the first time, presentations by analysts from allied nations (Australia, Canada, New Zealand, and the United Kingdom). The virtual symposium will include classified and unclassified briefings based on the type and number of abstracts submitted during the planning process.

The symposium week begins with the Rist prize competition, tutorials, and continuing education unit courses on Monday, June 16. New to the program this year will be one to three no-cost, short pilot courses based on topics chosen by the MORS Sponsors and the results of a survey conducted by the MORS Continuing Education Committee. These are in addition to two continuing education unit courses: “Introduction to Analysis for Practitioners” for new analysts, and “Introduction to Analysis for Study Leaders” for potential study leads.

Tuesday, June 17, continues bright and early with the CG/WG chair warm-up session, followed by the plenary session. The Sponsor’s Hot Topics panel will immediately follow the plenary session. The concurrent sessions for the CG/WG begin after lunch and continue through Thursday afternoon.

The 82nd MORSS will also feature a full program of posters and demon-

strations showcasing concepts and implementations. This provides a great opportunity to share your work and collaborate with peers. Individuals who have developed applications and tools are invited to share them through a demonstration to the MORS community. Demonstrations may include simulations, spreadsheet applications, modeling environments, and data collection and analysis techniques. Posters offer an opportunity to share your analysis in addition to or in place of a briefing to a CG/WG session. Contact the demos/posters coordinator, Mr. Eric Hansen (eric.hansen@sas.com), if you have ideas, comments, or questions related to setting up a demonstration or poster session.

The symposium program also includes numerous informative and instructive tutorials led by an array of outstanding educators, experienced practitioners, and renowned subject matter experts that begin on Monday morning. There will be presentations on topics that support new techniques and concepts being applied to analytical studies. The tutorials are free to MORS members and are \$75 for non-members who would like to attend the Monday tutorial sessions. Individuals must purchase a symposium registration and meet security requirements to attend tutorial sessions. Presentations on Monday range from 1-hour overviews to half-day in-depth classes.

During the week, tutorials are 1-hour in length during the lunch breaks. Please submit your tutorial abstract online through the 82nd MORSS website and contact the tutorial coordinator, Dr. Joe Adams (jadams@ida.org), with your ideas, questions, or comments.

The Special Session lineup promises to be very interesting, beginning with the MORS Sponsors' Hot Topics session immediately following the plenary session on Tuesday morning. Following that and throughout the remainder of the symposium will be sessions whose topics include the MORS Rist and Barchi prize winners, the Strategist's Corner chaired by Dr. Theodore Bennett (FS), the Deployed Analyst session featuring analysts from across the Department of Defense discussing their recent deployment experiences, and the MORS Heritage Session chaired by Ms. Deborah Ray, which always features fascinating presentations related to the history of operations research in the US military. There will be presentations about MORS workshops completed during the months leading up to the symposium, a Junior-Senior Analyst Session chaired by CDR Harrison Schramm, and additional military sponsor sessions on special topics of their choosing. In addition, for the first time, cadets from the United States Military Academy will present the winner of the annual Hollis Award, an award presented annually to individual cadets or cadet teams at the United States Military Academy in recognition of excellence in military operations research or systems analysis.

I hope that you will make plans to join us at the 82nd MORSS. We will have an outstanding program filled with topics of interest to everyone! 🌟

# KATRINA G. McFarland

## ASSISTANT SECRETARY OF DEFENSE (ACQUISITION)

Katrina McFarland is the Assistant Secretary of Defense (Acquisition) (ASD(A)).

In this role, she is the principal adviser to the Secretary of Defense and the Under Secretary of Defense for Acquisition, Technology and Logistics on matters relating to acquisition.

Previously, she served as the President of the Defense Acquisition University (DAU), where she continued to build DAU's outstanding reputation as the DoD's primary learning institution while overseeing the development and expansion of the acquisition curriculum and supporting learning opportunities for more than 150,000 members of the Defense Acquisition Workforce. Under her leadership, DAU provided practitioner training, career management, and services to enable the acquisition, technology, logistics, and requirements community to make smart business decisions and deliver timely and affordable capabilities to the war fighter. This included addressing the ever changing Defense Acquisition climate as required by the Under Secretary of Defense's (Acquisition, Technology and Logistics) "Better Buying Power" initiatives, and the recent National Defense Authorization Act directions and guidance.


Prior to joining DAU, Mrs. McFarland was the Director for Acquisition for the Missile Defense Agency (MDA)—a position she held since May 2006. As MDA's principal acquisition executive, Mrs. McFarland advised the Director



of MDA on all acquisition, contracting, and small business decisions. During her tenure, Mrs. McFarland's advice led to more than \$37 billion of sole source procurement activity being opened up to competition. Additionally, her successful efforts to centralize the acquisition of knowledge-based services enabled small businesses to compete for almost half of the MDA's knowledge-based service, while reducing related procurement costs. Other core responsibilities included the development of process activities and program policy associated with the execution of the single integrated Ballistic Missile Defense System (BMDS) research, development, and test program, and establishment of the Baseline Execution Review to ensure an integrated program execution of the BMDS occurred across the baselines of schedule, cost, performance, contracting, test, and operational delivery.

Mrs. McFarland began her civil service career in 1986 as a general engineer at Headquarters

Marine Corps where she was accredited as a Materials, Mechanical, Civil, and Electronics Engineer. In 1990, she was hired by the Department of National Defense, Ottawa, Ontario, where she executed Procurement Head of Electronics duties. In 1992, Mrs. McFarland returned to the Marine Corps—this time, Marine Corps System Command—where she was responsible for the acquisition of the USMC Aviation and Ground Command and Control, radars/sensors, air defense, Combat ID and Cooperative Engagement Capability initiatives. She continued to serve the Corps through February 2005, when she concluded her duties as the Director, Battle Management and Air Defense Systems (BMADS).

Mrs. McFarland's accolades and accomplishments are far-reaching. She has received awards for her efforts in the joint arena of CEC, C2, and Theater Missile Defense integration and received recognition for her work from agencies including Government Computing News. Her articles have been published in the Military Operations Research Society, American Society for Computer Simulation, and the International Aeronautical Engineering Societies Proceedings. She has received the Secretary of Defense Medal for Meritorious Service Award; and the Department of the Navy, United States Marine Corps, Commendation Medal for Meritorious Civilian Service. In addition, she is DAWIA Level-III-certified in program management, has a professional engineer license and has attained her Professional Management Project (PMP) certification. 

*Continued from page 27*

# The Goldilocks Fallacy

Pete Vanden Bosch, petevandenbosch@gmail.com

**W**e make choices between alternatives every day, usually without performing even simple decision analysis. Instead, we use heuristics, time-proven mental shortcuts that allow us to reach good decisions quickly. Sometimes, however, we apply those heuristics inappropriately and they become biases and fallacies. One we all seem particularly prone to is the Goldilocks fallacy, the misapplication of the Goldilocks heuristic.

The Goldilocks heuristic is a catchall principle used in numerous and various situations. Generally, we don't use it consciously; we simply apply it, and with good success. In the presence of conflict, we seek compromise. We keep to the middle of our lanes when driving, without calculating that this decision creates a safety margin, minimizing the consequences

if there is a sudden change or distraction. And when we see seven predictions for a hurricane's path, we intuitively assign higher likelihood to the intermediate predictions and less to the extremes, without consciously invoking the Law of Large Numbers. All of these mental shortcuts have some justification.

But we also apply this Goldilocks heuristic in questionable ways. This article focuses on the idea that, in decision problems where there are conflicting objectives, choosing a middle path often fails to give you the best decision, and sometimes leads to the worst.

## Example: Survivability vs. Effectiveness

The U-2 flies regular reconnaissance missions near the Demilitarized Zone between North and South Korea. Suppose tensions escalated between the nations and the Seventh Air Force Commander asked whether the usual

flight path should be moved closer to North Korea (to get better intelligence) or farther away (to ensure that the plane and pilot are safe and available to collect future intelligence).

The problem can be framed as a decision between three alternatives (move close in, move far back, or take an intermediate path), with two objectives (intelligence and survivability). One could evaluate the objectives for the three alternatives by creating measures for each and obtaining values by modeling and examining past quality of intelligence. Such an approach would yield a matrix similar to Figure 1.

One obvious next step is to weight the two objectives and combine them linearly. In this example, weighting the intelligence measure twice as heavily as the survivability measure results in the best objective being "close in," whereas weighting the survivability measure twice as heavily as the intel-



	Intelligence	Survival
Close In	0.80	0.60
Intermediate	0.68	0.62
Far Out	0.65	0.80

**Figure 1. Decision matrix for the U-2 problem.**

Intelligence measure results in the best objective being “far out.”

It turns out that, for this contrived example, the Goldilocks heuristic—blindly picking the middle alternative—fails to pick the optimum in each case. In fact, in this example, under any set of weights, the Goldilocks heuristic always leads to the worst alternative.

Such analytical situations are far from rare in the Department of Defense (DoD), Department of Homeland Security (DHS), and private industry. Decision makers find themselves forced to make judgments in cases that pit effectiveness against security, safety against efficiency, risk against cost, and many others. For many situations, an optimum does indeed lie between the extremes, but for many the optimum lies at one of the extremes.

### Quantifying the Fallacy

How often does an anti-Goldilocks situation occur in such decision problems? Can we put a value on how badly this heuristic fails us? We can consider problems that have been normalized to the structure in Figure 2, a typical step taken before weighting objectives, and one that does not cause any loss of generality.

Further, fix the weight of objective 1 at 1, and let  $b$  be the weight of objective 2, again without loss of generality. The question is: When (and how often) is the intermediate alternative the optimum? If the intermediate alternative is the optimum, then the

	$W_i = 2, W_s = 1$	$W_i = 1, W_s = 2$
Close In	2.20	2.00
Intermediate	1.98	1.92
Far Out	2.10	2.25

**Figure 2. Linear combination of objective measures for the U-2 example, for two sets of weights.**

combined value of the two objectives for the intermediate alternative exceeds that of either of the other two alternatives:

$$y_1 + by_2 \geq 1 \text{ and } y_1 + by_2 \geq b$$

These relationships can be seen geometrically. The two blue lines in Figure 4 represent the equality case of the two inequalities in the equation, which intersect the axes at (0, 1) and (1, 0), each with a slope of  $-1/b$ . The shaded area represents the points that correspond to the intersection of the two inequalities.

In the diagram in Figure 4,  $b \leq 1$ , in which case the binding constraint is  $y_1 + by_2 \geq 1$ , and the area of the shaded region is  $1/2b$ . In the case of  $b \geq 1$ , the binding constraint is  $y_1 + by_2 \geq b$ , and the area of the shaded region is  $b/2$ . Thus, if  $y_1$  and  $y_2$  are selected at random, the probability of the intermediate alternative being the optimum is

$$P(\text{alternative } y \text{ is optimal}) = \begin{cases} \frac{1}{2b} & \text{if } b \leq 1 \\ \frac{b}{2} & \text{if } b \geq 1 \end{cases}$$

This presumes no ordering of  $y_1$  and  $y_2$ . In most situations, the ordering is known. Suppose that  $y_1 \geq y_2$ , in which case either Figure 5a or 5b pertains.

With a bit more analytical geometry than the unconstrained case, it can be shown for this case that

$$P(\text{alternative } y \text{ is optimal}) = \begin{cases} \frac{b^2}{(b+1)} & \text{if } b \leq 1 \\ \frac{1}{b(b+1)} & \text{if } b \geq 1 \end{cases}$$

	Objective 1	Objective 2
Alternative x	0	1
Alternative y	$y_1$	$y_2$
Alternative z	1	0

**Figure 3. Normalized matrix for two-objective, three-alternative problems.**

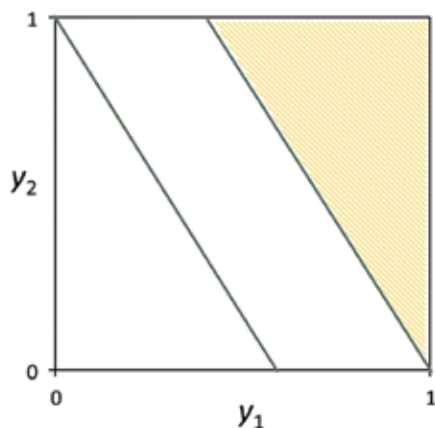
The key observations are that, for this very common type of decision problem, the probability of the intermediate alternative being optimal depends on the relative weights of the objectives. It is at most 50 percent, and it could be far less.

From an analytic standpoint, use of a Goldilocks heuristic in such problems can make sense only in the absolute absence of any information relevant to the decision. But even in the absence of the values of the objectives for each alternative, here is a better heuristic than Goldilocks: If  $b < 1$ , then choose alternative z; and if  $b > 1$ , then choose alternative x. Only if  $b$  is precisely 1 (or there is insufficient information available as to the relative weighting) would it be advisable to choose the intermediate alternative. Just how much better this heuristic is than Goldilocks depends on the range of possible values  $b$  might take. The larger the range, the worse Goldilocks fares.

### The Decision Process as a Whole

Operations research addresses only a portion of the decision process. If the goal is to ensure a good decision, there must be good data and good analysis, but the analysis has to be understood and believed as well. Mistakes in presentation of the facts and analysis can lead to triggering or failing to overcome a decision maker's biases and fallacies.

Most operations analysts are adept at the first two stages of Figure 6. But



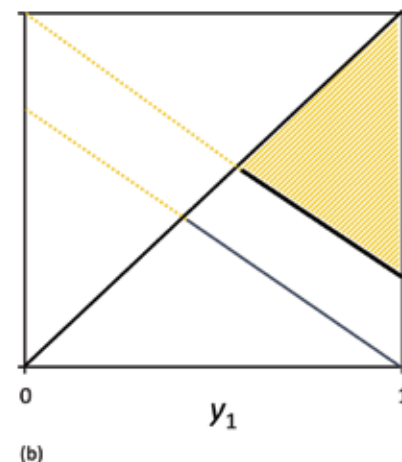
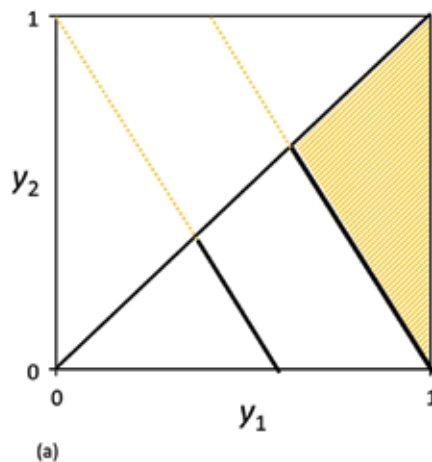
**Figure 4. Graphical representation of the intermediate alternative. The shaded region yields values that make the intermediate alternative optimal.**

our jobs often require us to be decision analysts, adept at all three. Yet, how many of us have taken a course in decision psychology or understand the range of psychological biases and fallacies that derail good decisions?

To understand the importance of this third stage, imagine you are a decision maker for Customs and Border Protection (CBP). Every port of entry is torn between two objectives: expedite legitimate commerce and interdict illegal trafficking. You've charged your analysts with coming up with a happy medium, the balancing point between the two, efficiency versus security. Instead of obeying that very clear instruction, they come back with some gobbledygook about how you should either pursue one or the other, that any middle course just makes things worse. (This actually appears to be true across a range of DHS efficiency versus security problems; see Vanden Bosch [2013].) Even if your analysts convince you, you can't imagine convincing your boss that you haven't gone off the rails.

### Why Do We Rely So Heavily on Goldilocks?

What is it that makes Goldilocks so compelling that, even in the face of



**Figure 5. Graphical representations of the intermediate alternative, if we know that  $y_1 \geq y_2$ . The first diagram shows the case for  $b \leq 1$ , and the second shows  $b \geq 1$ , because the shaded regions (where the intermediate alternative is optimal) have different geometries.**

good analysis suggesting otherwise, one still tends toward selecting the middle option as best? Here are some conjectures.

### Analogy

As noted in the introduction, a Goldilocks heuristic works well in many areas. As a result, there is a temptation to apply it to decision analysis or other inappropriate areas without much conscious thought.

### Political necessity

In some situations, there is a need to assuage various parties by giving each a part of what they want. In the CBP example, for instance, analysis probably won't carry the day; the decision will be driven by other considerations.

### Focus on the worst case

Generally, if we exclude worst cases (those alternatives for which one or more objectives have lowest values), then intermediate solutions result. This certainly is true of the class of decision problems analyzed earlier. In many situations, eliminating the alternatives that yield worst cases is prudent, based on careful analysis of the decision maker's value system. Sometimes it is not. In this analyst's opinion, a choice of a minimax regret decision process over a

linear combination process should be justifiable for reasons other than putting an analytical fig leaf on decision makers' prejudices against extremes.

### Monday morning quarterbacking

Consider the U-2 example again, but from the perspective of the next day, after the mission. If the decision had been the distant alternative, and no good intelligence had been collected, would the Seventh Air Force Commander be criticized for his or her choice? If the decision had been the close alternative, and the plane had been shot down, would the Commander still have a job? And does the knowledge of these after-the-fact consequences affect the Commander's decision? This is closely related to, but arguably distinct from, a focus on worst case. (Simonson, 1989, p. 159).

### Structure of the utility functions

Two aspects of typical utility functions can make the intermediate alternative more attractive than a linear utility function would.

- Dwindling returns. There is a well-known tendency for individuals to value a unit increase less at higher values, resulting in a



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## Forget about the porridge, I made Goldilocks stew

leveling off of the utility curve. The same effect is evident for losses. The utility curve will therefore tend to have a “knee” at whatever point someone measures losses and gains from. In decision psychology, this reference point is called an anchor. (In *Thinking Fast and Slow*, Daniel Kahneman provides an entire chapter on anchoring and its effects that is worth every analyst’s attention.)

- Valuing losses more than gains. Tversky and Kahneman (1981) also showed experimentally that losses are valued twice as much as gains. This decrease in the slope of the utility curve at the anchor also creates a knee (Kahneman 2011, pp. 284–285).

When two conflicting objectives are linearly combined, and each has a knee near the same place, there may be a local maximum or minimum. Individuals tend to choose intermediate points for anchors, and therefore there is the potential for that intermediate alternative to be elevated in value. Individuals create these anchors in remarkably arbitrary ways (Tversky and Kahneman, 1981, p. 456). The resulting decisions are therefore capricious at best.

### Cultural signals

From Aristotle on, we’ve been taught that every situation has a middle ground. If you search the Internet for “Goldilocks” or “happy medium,” you will be overwhelmed with the positive

bias toward intermediate alternatives. Further, some of us were taught explicitly in various service schools to present a decision maker with three options, and to place the proposed course of action between the others. (Instructors articulated this principle in classes I attended, both in Air Force Officer Training School in 1984 and in Air Force Squadron Officer School in 1990.)

This partial list suggests the remarkable range of pressures—practical, psychological, and political—that may drive a decision maker or analyst toward the intermediate alternative. In the face of such pressures, maybe it is remarkable that we do pursue solutions analytically, rather than just trust that the Goldilocks heuristic won’t mislead us.

## Conclusion

It’s not news that there are fallacies and biases that affect both analysts and decision makers, or that these can prevent good decisions. Calling this particular one the Goldilocks Fallacy may be new, but the fallacy itself was recognized in the decision psychology literature of the 1970s and 1980s (Simonson, 1989, p. 158). Still, it does not seem to have been addressed by the community of operations analysts. This is remarkable, considering how often a Goldilocks heuristic is used and how often it can fail us in the pursuit of a good decision. This cursory analysis addresses a small but significant subset of problems and quantifies just how poor the heuristic is. It also conjectures as to the likely reasons we so often turn to it for fast assessment of a situation. 🍯



**Figure 6. More than just poor data and bad analysis can derail the decision process.**

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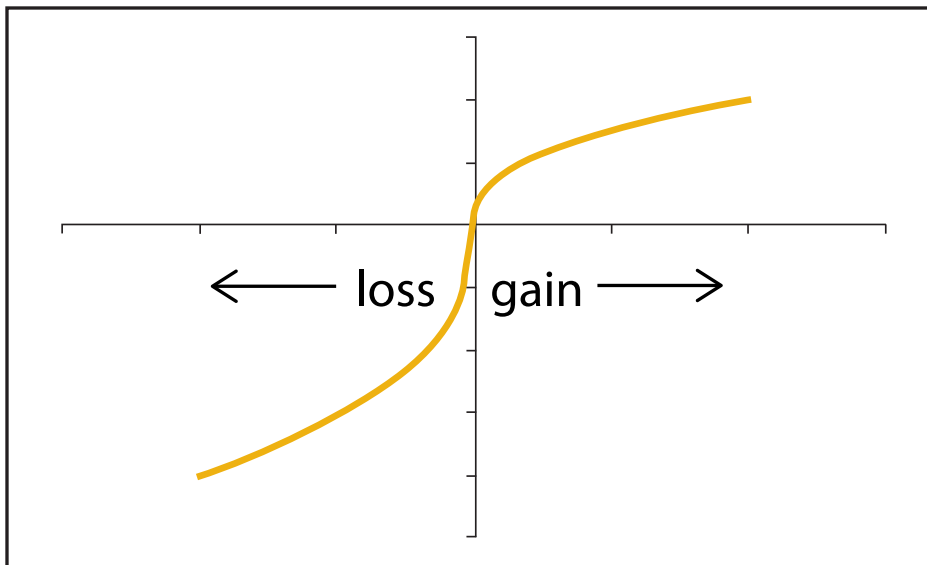


Figure 7. The combination of psychological anchoring to an intermediate alternative and the perception of decreasing returns creates a knee in the utility curves and results in a maximum or minimum at that point. To a lesser degree, the valuation of losses over gains also creates a knee in the utility curve. (Adopted from Tversky and Kahnemann, 1981, p. 454).

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### About the Author

Pete Vanden Bosch is an adjunct professor at Marymount University and Northern Virginia Community College. He's a retired Air Force officer, spending most of that career as an operations analyst. He also performed studies for Department of Homeland Security for several years. His current research interests are in educational psychology.



# BONDER SCHOLARSHIP APPLICATION PROCESS

The Military Applications Society (MAS) of INFORMS is seeking nominations for the 2014 Bonder **Scholarship for applied operations research in military applications.**

The purpose of this scholarship for applied operations research in military applications is to promote the development and application of process modeling and operations research analysis to military issues. The scholarship provides funding to support the development of highly qualified individuals and promote the interchange of military OR research knowledge in conjunction with INFORMS.

Students pursuing doctoral studies in military operations research or a related discipline are eligible, particularly those with two to three years remaining in their programs. Applications from **US and international students** are welcome.

Candidates should submit the following materials electronically:

- a curriculum vita
- two letters of support (note: In a few cases, when it is needed in order to fully represent the academic and practical strengths of an application, a third letter may be appropriate)
- a brief statement describing why they are interested in applying operations research to military issues
- a two-page summary of their proposed program of research

Applications are to be submitted by candidates, and letters of support by their respective authors, in portable document format (PDF) via email by **June 2, 2014** to:

**Greg H. Parlier, COL USA ret**  
**MAS Past President, 2014 Committee Chair**  
**voice: +1 256-457-9782**  
**e-mail: gparlier@knology.net**

Further details may be found on the MAS Awards web page:

**<https://www.informs.org/Community/MAS/Awards>**

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# Inconsistencies in Joint and Allied Methods for Course of Action Comparison

MAJ James P. L. Holzgrefe, US Army, james.p.holzgrefe.mil@mail.mil; and Dr. Patrick T. Hester, Old Dominion University, pthester@odu.edu

**F**ifteen methods spread across six publications with little guidance on how to choose the appropriate one: that is one challenge faced daily by US and allied staffs comparing military courses of action (COAs) during tactical and operational planning. The effects of these inconsistencies in COA comparison are potentially catastrophic in terms of lives lost, equipment destroyed, or national objectives unachieved should the incorrect COA be selected based on a flawed recommendation. For this reason, planners, commanders, and other decision makers should reconsider the necessity of these divergent methods and consider rewriting planning doctrine to capture the best practices in multiple attribute decision making (MADM) from inside and outside existing doctrine.

## Background

The US military and its allies conduct tactical and operational planning following six similar yet distinct military planning processes that are listed with their references in Table 1. One of these similarities is that each planning process includes a step that analyzes and compares potential military COAs. This step is usually called COA comparison. In this step, planning staffs evaluate COAs as discrete, predetermined alternatives against one or more criteria (i.e., attributes, goals, or governing factors) in a MADM process. Most of these processes recommend the format of a decision matrix for their evaluations as depicted in Table 2.

## Organizing the Methods

Currently, the doctrine of the US Army, Marine Corps, Navy, Air Force, Joint Staff, and NATO each recommend

different decision-making methods to evaluate the COA comparison decision matrix in Table 2. In fact, 15 different methods are recommended across five of the six publications, as shown in Table 3. The Air Force is missing from the comparison in Table 3 because it leaves the method completely up to the planners with no recommendations.

These 15 methods are grouped into broad categories in the third column of Table 3 to better communicate their relationships. The “descriptive” category consists of methods that are purely descriptive and qualitative. The “additive” category groups quantitative methods that apply the simple additive model of adding criterion scores across COAs and comparing the totals. The “additive weighting” category builds on the

additive method by employing weights in each category, a MADM method commonly known as simple additive weighting. The “plus minus neutral” category groups methods that use combinations of positive, negative, and neutral

**Table 1. Military planning processes.**

Organization	Planning Process Name	Doctrinal Publication
US Army	Military Decision Making Process (MDMP)	Army Tactics, Techniques, and Procedures 5-0.1
USMC	Marine Corps Planning Process (MCPPE)	Marine Corps Warfighting Publication 5-1
US Navy	Navy Planning Process (NPP)	Navy Warfare Publication 5-01
USAF	Joint Operation Planning Process for Air (JOPPA)	USAF Doctrine Document 3-0
Joint Staffs	Joint Operation Planning Process (JOPP)	Joint Publication 5-0
NATO	Operational Level of the NATO Crisis Response Planning Process	NATO ACO COPD V1.0

**Table 2. Example military decision matrix.**

Course of Action (COA)	Criteria 1	Criteria 2	Criteria 3
COA 1			
COA 2			
COA 3			

**Table 3. COA comparison method classification.**

Organization	COA comparison method name	Type	Broad category
US Army	Advantages/disadvantages	Qualitative	Descriptive
	Unweighted decision matrix	Quantitative	Additive
	Weighted decision matrix	Quantitative	Additive weighting
USMC	Narrative description	Qualitative	Descriptive
USN	Nonweighted numerical	Quantitative	Additive
	Weighted numerical	Quantitative	Additive weighting
	Plus/minus/neutral	Quantitative	Plus minus neutral
	Advantages and disadvantages	Qualitative	Descriptive
Joint staff	Weighted numerical	Quantitative	Additive weighting
	Nonweighted numerical	Quantitative	Additive
	Strengths and weaknesses	Qualitative	Descriptive
	Advantages and disadvantages	Qualitative	Descriptive
	Plus/minus/neutral	Qualitative	Plus minus neutral
NATO	Advantages and disadvantages	Qualitative	Descriptive
	Energy course of action (COA) comparison	Qualitative	Enemy COA

ratings to select a preferred COA. Finally, the “enemy COA” category highlights a unique NATO method that focuses on the enemy’s COAs, rather than the friendly force’s COAs. Each organization addresses these categories differently, as outlined in Table 4. These inconsistencies pose challenges for the military planner both within his or her own organization and when collaborating with other organizations. One challenge within the staff lies in choosing the correct method for the data type and information available. A separate challenge in collaboration is the need for standardized communication of the method performed.

### Inconsistencies

There are several layers of inconsistencies in how these methods are recommended throughout doctrine. First, there is inconsistency between organizations on which methods are recommended or allowed, as shown in Tables 3 and 4. Second, there are inconsistencies in what criteria should be evaluated. Third, there are inconsistencies in how seemingly similar methods recommended across organizations are implemented. Each layer is considered in more detail in the following paragraphs.

The inconsistencies in recommended methods between organizations may

surprise some given the interdependent and hierarchical nature of these organizations’ relationships to one another. Others may see these inconsistencies as a product of unique organizational cultures, planning in different battle-space domains, planning at different levels of war, or some combination thereof. Regardless, the variance is quite stark when comparing the two extreme cases in terms of flexibility represented by the USAF and the USMC. USAF doctrine does not recommend a method for COA comparison, leaving methodology selection completely up to the staff based on staff expertise and their planning problem’s unique

context. In contrast, USMC doctrine recommends a qualitative narrative description method and discourages any quantitative methods. The remaining organizations recommend or require some methods while giving staffs the flexibility to choose additional methods not included in their doctrine.

The second layer of inconsistency between methods is the amount of flexibility given on criteria. Each organization, except for the USAF, leaves the selection of evaluation criteria completely up to the commander and staff. What sets the USAF’s guidance apart is that it prescribes risks to forces and

**Table 4. COA comparison methods by organization.**

Organization	Broad COA comparison method				
	Descriptive	Additive	Additive weighting	Plus minus neutral	Enemy COA
USA	Required	Recommended	Recommended	Allowed	Allowed
USMC	Required	Discouraged	Discouraged	Not addressed	Not addressed
USN	Recommended	Recommended	Recommended	Recommended	Not addressed
USAF	Allowed	Allowed	Allowed	Allowed	Allowed
Joint Staff	Recommended	Recommended	Recommended	Recommended	Not addressed
NATO	Required	Allowed	Allowed	Allowed	Required

weighting method. The rating scales and directionalities remain different despite the common use of interval scale weights. Table 6 summarizes these differences. Once again, no two methods are the same.

### Way Ahead

This article highlighted the inconsistencies in the MADM methods employed by US and allied staffs in the analysis and comparison of potential military COAs during

**Table 5. Unweighted additive COA comparison methods.**

Organization	COA comparison method	Rating scale	Directionality
USA	Unweighted decision matrix	Ordinal	Less is better
USN	Nonweighted numerical	Interval	More is better
Joint Staff	Nonweighted numerical	Ordinal	More is better

risks to mission as evaluation criteria that should always be used. These criteria should be considered in any planning process and are likely to be considered by planners in the other organizations, so this inconsistency is the least troublesome.

Of greatest concern are the ways that methods across organizations with the same name or similar methodology in Table 3 are not performed in the same manner. Differences in the qualitative methods stem largely from how the advantages and disadvantages of each COA are categorized, but that is primarily a difference in style rather than substance. Differences in the quantitative methods deserve additional consideration, beginning with the three unweighted additive methods. Table 5 summarizes these differences. Note that no two methods are the same.

Inconsistencies in the unweighted additive methods recommended by the Army, Navy, and Joint Staff center on

two factors represented in the last two columns of Table 5. First, there is inconsistency in the scale used for ratings of how well each COA scores in each criterion. Army and Joints Staff doctrine use ordinal rankings for their ratings, whereas Navy doctrine prescribes interval ratings. The ordinal scale allows a planner to rank COAs, but not to determine the magnitude of preference, whereas interval scales allow for both ranking and determining the magnitude of preference. The distinction between these scales is important because of the different mathematical operations that may be applied to each scale type (Stevens, 1946). The second inconsistency lies in the directionality of the scoring. The Army ratings are based on a “less is better” approach, whereas the Navy and Joint methods use “more is better.” One can see the potential for confusion when moving from one organization to the other.

A similar inconsistency occurs in the different application of the simple additive

planning. These inconsistencies have the potential to result in inferior COA selection, resulting in reduced mission performance. Some critics have argued that such inconsistencies between planning processes prevent Joint Staff officers from effectively working together as envisioned in the 1986 Goldwater-Nichols Act (Anderson and Slate, 2003). We intend to carry out the research outlined below with these concerns in mind.

The first research step is to review relevant literature with three goals in mind. First, determine what characteristics make a MADM method approachable, useful, and meaningful to a military staff. Second, use those characteristics to find methods outside of military doctrine that may apply to the planning processes. Third and finally, identify a classification system for the methods. This step leaves us with a comprehensive list of methods and a means to classify them.

*Continued on page 42*

# BIG DATA & BIG DATA ANALYTICS

J. Henningsen, B. Cavender, J. Muccio, J. McQuade, T. Herbranson, and C. Moore

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*Dr. Jaqueline Henningsen, SES, FOS, is the Director for Studies and Analyses, Assessments and Lessons Learned, Headquarters US Air Force. Dr. Henningsen commissioned a high impact team in the fall of 2013 to brainstorm on the latest Big Data initiatives and DoD improvement areas, for a presentation at the MORS Industry Showcase. After developing the presentation, a breakout team continued to work on the problem and crafted this article to explore the potential of Big Data in the MORS and DoD community.*

In Carl Von Clausewitz's seminal writing, *On War*, he extensively describes the uncertainty and ambiguity faced by participants in military operations. We often characterize this uncertainty as "the fog of war," and we can extend this application to the chaos and uncertainty decision makers face each day. As analysts, part of our expertise is to make sense out of chaos, and data is a foundational part of the stories we untangle. Since the dawn of the computer, academics have measured the growth and availability of data (Press, 2013). In the beginning, we stored kilobytes of data on magnetic disks and used punch

cards. Now, every year the world produces more data than previous years combined, and the NSA is building a yottabyte

Big Data" (Office of Science and Technology, 2012), investing \$250 million annually into research.

### How we can capitalize on the promises of Big Data?

storage facility. Our continued advances in technology and data analysis have led the computing community to embrace and popularize the phenomenon known as "Big Data" (Bryant et al. 2008). As the world transitions to the age of Big Data, the Department of Defense (DoD) and other government agencies have recognized this opportunity and are placing a "big bet on

As the DoD continues to examine Big Data applications, technology, analytics, and information management techniques, we must also understand how it will change our culture and how to capitalize on the promises. According to Gartner "Big Data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information pro-

cessing for enhanced insight and decision making” ([www.gartner.com/it-glossary/big-data](http://www.gartner.com/it-glossary/big-data)). From this definition, we get the three Vs of Big Data: volume, velocity, and variety. Volume refers to the sheer size of the data set. Velocity deals with how quickly the data can be made available for analysis. Variety references the types of data being considered. The three Vs of Big Data make it clear that the “big” in Big Data doesn’t just refer to size, but also complexity.

Most importantly, the definition of Big Data speaks to the ultimate goal of data analysis: providing the most refined information to facilitate decision making. As we seek more effective methods of managing Big Data, we must also consider the ways we will use it to inform decisions. Whether we are considering

warfighting, personnel, the planning, programing, and budgeting system (PPBS), test and evaluation, or acquisitions, Big Data will play a role in the process.

For instance, people are the most important resource for any organization and the DoD is no different. Can DoD leverage Big Data to help recruit, train, and retain the best people possible? Industries across the globe have already begun to utilize Big Data to study “people analytics” (Wa-

sity for risk-taking. Companies such as Bain and Shell then use this information to determine the best people to hire. Alternatively, consider applications in the medical field. Currently, doctors view patient records as a single data point. Under preventative health programs, with new data techniques, doctors could forecast patient health indicators and determine appropriate treatments. This could lead to a decrease in overall healthcare costs.

**The ability to use Big Data provides the DoD with an unprecedented and extremely powerful capability.**

ber, 2013). For example, Knack, a Silicon Valley start-up firm, uses computer games and constant measurement to test emotional intelligence, cognitive skills, working memory, and propen-

In another area, companies like Progressive Insurance provide a model for understanding Big Data applications. They are using Big Data to meet shareholder demands and increase profit (SAS,

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2013). In the DoD, we could use Big Data to help leadership navigate the array of factors that influence budget creation and force optimization. Big Data could help analysts link concepts and illuminate trade spaces. Over time, we could leverage simulations to analyze program effectiveness to the warfighter, determine where to continue investments, and discover future requirements. From early warning to stabilization, there are countless opportunities for the exploitation of Big Data. However, just because industry has adopted Big Data in their day-to-day operations does not mean that translating these applications into military concepts will be easy.


To create a Big Data culture in the DoD, we need to shift not only the way we process data,

but also how we think about it. Decision makers and commanders will need to understand the power of Big Data and its inherent usefulness on the battlefield. In addition, we must consider potential detractors, such as how our adversaries could capitalize on Big Data, or the security implications of aggregating massive amounts of unclassified data. Finally, the benefits of Big Data will take time to mature, requiring additional resources to implement, with no tangible near-term benefits. A continual, compelling story is necessary to maintain the culture shift and ensure strong leadership support in order to maintain the culture shift.

Big Data is ripe with opportunity, and as analysts we need the vision to explore the possibilities

and problems associated with it. In July 2013, the White House Office of Science and Technology directed federal agencies to “give priority to investments that address the challenges of, and tap the opportunities afforded by the Big Data revolution” (Locker, 2014). This mandate opens the door to integration across stovepipes and improved efficiency and effectiveness across the department. However, initial benefits are likely to be intangible and require strong commitment to ensure return on investments. This should not dissuade us from embracing Big Data because it provides the DoD with an unprecedented and extremely powerful capability.

If you are interesting in sharing information about projects, applications, and research into Big Data,

please join the DTIC R&E Gateway, Big Data Group. 

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### ... Inconsistencies Comparison *Continued from page 37*

The second step of the proposed research will classify the methods based on the characteristics of the problems that they apply to. MADM methods must be matched to problems with the appropriate data types. This leads to step three, which will screen the classified methods based on mathematical legitimacy and mathematical approachability for a military staff. The approachability aspect is important because many MADM methods use exquisite calculations requiring significant computing power. Such complex methods are likely inappropriate for staffs operating in austere environments and relying on personnel with varying degrees of mathematical fluency. This screening should result in a smaller set of recommended MADM methods for military planning staffs.

The final step of this proposed work creates a visual decision support tool for the staff. The tool would allow a staff to quickly choose from a list of valid and approachable MADM methods based on their problem's unique characteristics, such as availability of information and data types. Similar work has already been done for MADM methods in general (Hwang and Yoon, 1981).

In conclusion, although the inconsistencies in MADM methods used in military planning may lead to planning missteps now, they also offer the opportunity to reassess their validity and create a tool for all staffs to better analyze and compare potential military COAs. In the meantime, staff members with a high degree of mathematical fluency should guide staffs to the most appropriate methods for their particular planning problem's characteristics and context. This reinforces the need for analytical experts in the headquarters of tactical and operational units, and the even greater need for that expertise in organizations that write and review planning doctrine. 🍷

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### About the Authors

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# ISMOR and Cornwallis Join Forces

Gene Visco, FS, [eugene.visco@lmco.com](mailto:eugene.visco@lmco.com)

**T**he 31st International Symposium on Military Operational Research (ISMOR) will be held at the Royal Holloway campus, University of London, England, July 29 through August 1, 2014. A short ride from Heathrow Airport, and at the successful site of 30 ISMOR, 31 ISMOR will feature an important innovation. The Cornwallis Group will be present with a different type of program: fewer papers but an extended opportunity for presentations and interaction with the attendees. By agreement of Peter Starkey, permanent chair of the ISMOR series, and Tony Hopkin, the new Cornwallis chair (replacing the senior founder and long-standing chair, Professor Dave Davis), 31 ISMOR will introduce this first great combination of two of the foremost institutions covering the field of operational analysis applied to national and international security issues and the search for peace among nations.

Present plans include the Cornwallis session for the Wednesday segment of the program, which will begin, as usual, on Tuesday, July 29, 2014. Because Cornwallis takes fewer papers on a single topic and allows time for in-depth discussion, this represents an attractive complement to the other ISMOR sessions. The Cornwallis session will run as a parallel stream to workshops and tutorials. Wednesday will be a workshops and tutorials day, with the other days having sessions of papers and discussions. Such sessions will be seeded with invited papers to encourage discussion. There is a possibility for a Friday (August 1) afternoon session.

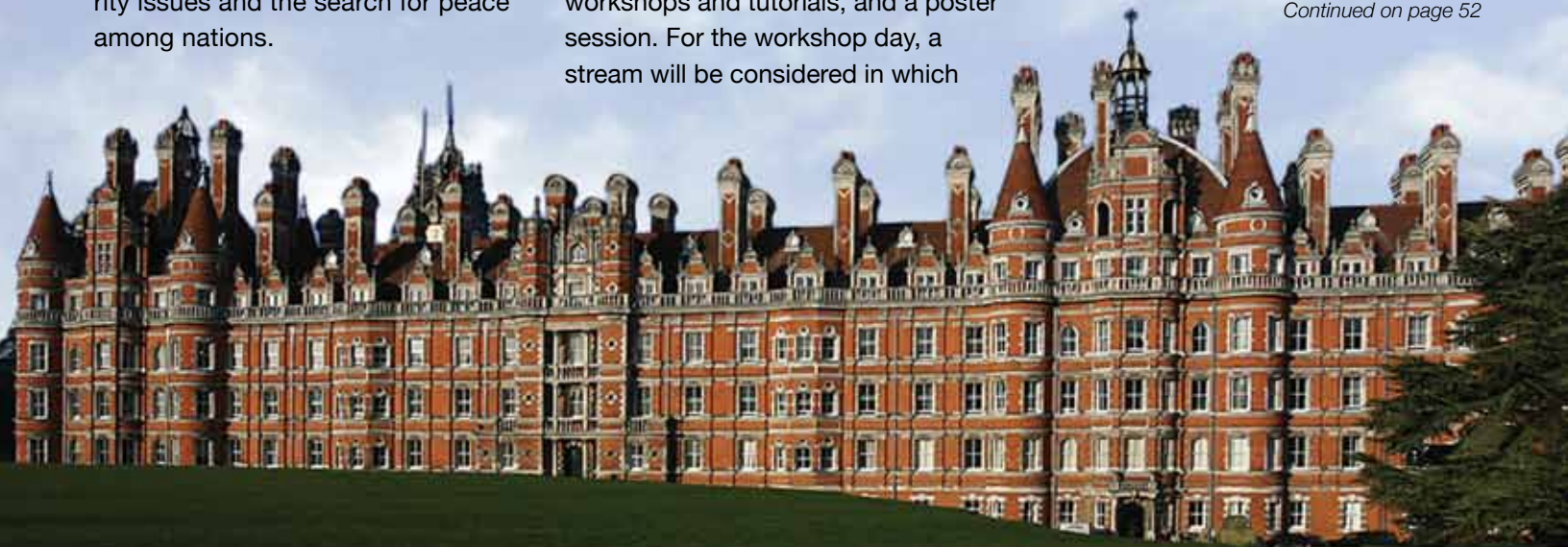
All the ingredients of the past two ISMOR conferences were agreed upon as being worth continuing: short papers on specified predetermined themes and papers that do not fit themes, one or more keynotes, invited workshops and tutorials, and a poster session. For the workshop day, a stream will be considered in which

younger analysts and possibly students give short presentations on their work as a graduate briefing or peer review session. Universities may be invited to participate in this session.

In addition to the normal full residential attendance for the week, flexible attendance will be offered as an option for 31 ISMOR to encourage participation, especially as many cannot find time in their schedules for the whole event. To maintain the distinctive benefits of ISMOR as an informal, residential event, allowing plenty of time for interactions and personal discussions, an appropriate pricing structure will encourage people to attend the entire week.

The Cornwallis Group is a spin-off from MORS and ISMOR. It was founded 19 years ago, at the end of the Cold War. The founders observed that, with the collapse of the Soviet

*Continued on page 52*



# MORS Heritage Pages

## 1993-1996

As we continue the countdown to the 50th Anniversary of MORS, we would like to revisit our proud history and highlight the past leaders of the Society and key accomplishments over those years. Each edition of *Phalanx* will provide insight into several years of history. Enjoy reading about these individuals and what they have accomplished. More information on the Past Presidents, including their Oral Histories, can be found on the MORS website.

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## Significant Events

**62nd MORS Symposium**, United States Air Force Academy, Colorado Springs, Colorado, June 7–9, 1994. *Expanding Horizons: Matching Requirements, Opportunities and Resources*. James N. Bexfield, FS, received the Wanner Award.

**63rd MORS Symposium**, United States Naval Academy, Annapolis, Maryland, June 6–8, 1995. *Joint Analysis for Joint Operations*. E. B. Vandiver, III, received the Wanner Award.

**64th MORS Symposium**, United States Army Combined Arms Center, Fort Leavenworth, Kansas, June 18–20, 1996. *Leveraging Technology for the Military Analyst*. Edward C. Brady, FS, received the Wanner Award.

**1993–1994**: Dr. Marion Williams, FS, and James Sikora, FS, formed a Models and Simulation Validation MORS Senior Advisory Group.

**1993–1994**: Jim Richmann replaced Dee Ritchie as *Phalanx* editor.

**1994**: The following individual was inducted as Fellow of the Society: Dr. Seth Bonder, FS.

**1994**: Series Editor LTC Mark Youngren announces that the initial volume of the *Military OR Analyst's Handbook* is available for purchase.

**1994–1995**: The United States Marine Corps became the sixth MORS Sponsor.

**1994–1995**: First year of publication of the *MOR Journal* completed.

**1994–1995**: Dr. Julian Palmore served as *Phalanx* guest editor for the Special ADS/DIS Edition and, in September 1995, replaced Jim Richmond as editor.

**1995**: The following individual was inducted as Fellow of the Society: Walter W. Hollis, FS.

**1996**: The following individuals were inducted as Fellows of the Society: Dr. William G. Lese, Jr., FS; James J. Sikora, FS; and E. B. Vandiver, III, FS.

## MORS Presidents



### 28th MORS President: Gregory S. Parnell (1993–1994)

**Greg Parnell** served as MORS President in 1993–1994, was elected a MORS Fellow in 1997, was the Clayton Thomas Laureate in 2002, and received the Wanner Award in 2013. He was the second editor of the *Military Operations Research* journal (1996–2001).

For his undergraduate studies, Dr. Parnell attended the State University of New York at Buffalo, where he majored in aerospace engineering. He earned his master's degree in industrial and systems engineering from the University of Florida, and his PhD in engineering-economic systems (now called management science and engineering) from Stanford University.

Dr. Parnell is a retired Colonel in the US Air Force with 25 years of service. He was a professor of systems engineering from the United States Military Academy at West Point (1999–2013). He was distinguished visiting professor at the United States Air Force Academy (2011–2012) and taught at the Virginia Commonwealth University and the Air Force Institute of Technology.

Dr. Parnell has also served as President of the Decision Analysis Society of the Institute for Operations Research and Management Science (INFORMS). He has also served on three National Research Council committees.

He is a Fellow of INFORMS, the International Committee on Systems Engineering (INCOSE), the Society for Decision Professionals, and the Lean Systems Society.

Dr. Parnell is currently a visiting professor of industrial engineering at the University of Arkansas, where he teaches decision analysis, systems engineering, and project management. He is also a senior executive principal at Innovative Decisions Inc.



#### 29th MORS President: Brian McEnany (1994–1995)

**Mr. Brian R. McEnany** was elected to the Board of Directors in 1990. He subsequently chaired two working groups, became Vice President for Professional Affairs in 1993, and served as President of MORS from 1994 to 1995. In 1999, he was elected a Fellow of the Society (FS). He has also served as a WINFORM's Trustee.

He received a bachelor of science degree from the United States Military Academy in 1962 and master of science degrees in ORSA/statistics and in management science from Rensselaer Polytechnic Institute in January 1970.

After serving 22 years in the US Army, he retired as a Lt. Colonel in 1984 and joined Science Applications International Corporation (SAIC). Much of his career with SAIC was devoted to applying decision analytic and modeling support in finding solutions to US Army and US Marine Corps study requirements. As an Assistant Vice President for Technology, he managed and developed theater models for the Joint Staff and helped convert military tactical knowledge into combat instruction sets for computer-generated forces for the Army's Close Combat Tactical Trainer, UK Combined Arms Tactical Trainer, and STRICOM's Dismounted Warrior Network. Other projects included the development of methodologies to assess and measure progress in humanitarian de-mining programs for the Department of State.

Mr. McEnany continues to provide advice and assistance to the leadership of MORS and intermittently reviews publications and papers as an associate editor of the *Military Operations Research* journal. Now retired, he is writing articles and a book about West Point during the Civil War.



#### 30th MORS President: Christine Fossett (1995–1996)

**Ms. Christine Fossett** served as Vice President for Administration in 1993–1994, and Vice President of Professional Affairs in 1994–1995 prior to being elected President in 1995. She was elected Fellow of the Society in 1998.

Ms. Fossett attended Purdue University for her undergraduate studies and received her master's degree in medical sociology with a minor in public health from the University of Pittsburgh in 1972.

In her early career, Ms. Fossett worked at the Pittsburgh Board of Public Education evaluating federally funded programs; the Harrisburg, Pennsylvania, Governor's Justice Commission evaluating and planning for the use of federal Law Enforcement Alliance of America (LEAA) money; and for the Washington, DC, Housing and Urban Development (HUD) Community Block grant programs. She joined the Government Accountability Office (GAO, formerly General Accounting Office) in 1980.

At GAO, Ms. Fossett worked on numerous programs, including assessing DOD's Joint Test and Evaluation program and evaluating the credibility of selected weapon systems through operational effectiveness simulations; assessing data

and analyses used to support requirements for electronic warfare systems; reviewing Trident and START arms control and force structure issues as part of a broader review of strategic TRIAD; evaluating antiterrorism measures for selected infrastructure components (mass transportation and federal courts)—this followed the Beirut bombing; and synthesizing evaluations of the impact of the Special Supplemental Food Program for Women, Infants, and Children (WIC).

Ms. Fossett also worked in GAO's Defense Capabilities and Management (DCM) (formerly National Security International Affairs Division [NSIAD]) working on recruiting and attrition issues, especially regarding criminal backgrounds. This work resulted in more thorough screening for criminal conduct.

Ms. Fossett retired from GAO at the end of 2007 and continues to provide advice to MORS leadership.



## A TRIBUTE TO MR. SEYMOUR (SY) DEITCHMAN (1923–2013)

Jim Bexfield, FS, [jim\\_bexfield@comcast.net](mailto:jim_bexfield@comcast.net)

Philip Major, IDA, [pmajor@ida.org](mailto:pmajor@ida.org); and Bob Sheldon, FS, [bs@group-w-inc.com](mailto:bs@group-w-inc.com)

**M**r. Seymour (Sy) J. Deitchman, the MORS Vance R. Wanner Memorial Award laureate in 2000, died on October 11, 2013. Sy was interviewed for the MORS oral history program on September 12, 2008 and October 8, 2008 and the interview was published in *Military Operations Research* (Volume 15, Number 2, 2010).

Mr. Deitchman served in private industry, in the Defense Advanced Research Projects Agency (DARPA) and the Office of the Secretary of Defense (OSD), as vice president for programs at the Institute for Defense Analyses (IDA), and as a member of US Government and North Atlantic Treaty Organization (NATO) advisory panels. Since 1982, he served as a member and then as a Consultant and Special Advisor to the Naval Studies Board of the National Research Council. During his career, he conducted detailed technical analyses, managed research and development programs, was a corporate officer, and wrote six professional books, including *On Being a Superpower: And Not Knowing What*

*to Do about It*, published in 1999, as well as more than 50 published papers and reports.

Sy spent 30 years at IDA, interrupted by two leaves of absence—totaling five years—to serve in the Depart-




ment of Defense. Sy joined IDA as a research staff member in 1960 from the Cornell Aeronautical Laboratory. From 1969 to 1988, Sy reported directly to the IDA President, helping oversee the quality and effectiveness of IDA's research program, first as a Director and then as an Assistant Vice President and Vice President. Over that period, he made many

contributions to both the substance of IDA's research for the government and the management of the Institute. Sy's substantive contributions spanned an enormous range of research topics, including counterinsurgency technologies and operations, tactical warfare modeling and simulation, air combat testing, ballistic missile defense, naval warfare, and manned space flight, to name just a few. Perhaps most noteworthy in terms of research management was the essential role Sy played in reorganizing, refocusing, and reinvigorating IDA in the 1980s under the leadership of then IDA President General Andrew Goodpaster, USA (ret). During that time, Sy assumed line management responsibilities for most IDA research activities, helping create a culture of responsiveness to sponsor needs and establishing new IDA research groups focused on emerging DoD priorities in information technology, cost analyses, and operational testing. Sy's intelligence, common sense, and dedication to national security were demonstrated daily over a long and successful career at IDA.

Sy was one of the nation's most accomplished and well-regarded analysts of defense issues. He was renowned for his ability to integrate the multiple dimensions of problems into a form that was readable, understandable, and actionable. In doing so, he

exemplified the highest standards of operations research, which include a passion for clear thinking, creative option development, objective assessment, sound analysis, integrity, and depiction of conclusions in a form that policymakers can use.

In recent years, Sy was engaged with the MORS Social Science Community of Practice. He shared lessons from the use of social science during the Vietnam War that are relevant to current studies of irregular warfare. 

# Puzzlor

## GOLF QUEUING

Golfing can be an enjoyable and rewarding way to spend your time. Despite the attraction and fun of the game there can be many challenges. One of the more common challenges for experienced players is waiting for slower players to finish a hole before the experienced player can start.



As the owner of a 9 hole golf course, you currently have a First-In-First-Out policy. In other words, faster players are not allowed to jump ahead of slower players. You are considering changing this First-In-First-Out policy to a Priority queuing policy to allow faster players to jump ahead of slower players in between holes.

Players arrive at your golf course at an interarrival time of 10 minutes, exponentially distributed. The players on your golf course have 3 different skill levels. Fast players complete holes at an average of 5 minutes. Medium players complete holes at an average of 7 minutes. Slow players complete holes at an average of 10 minutes. All distributions are normal and have a standard deviation of 1 minute. Player skill level is randomly distributed (1/3 Fast, 1/3 Medium, 1/3 Slow).

Assume players start golfing as soon as they arrive on the course and that the system has achieved steady state. Each player is golfing individually (not in a group) and players must go in sequential order from hole 1 to hole 9. Players can only jump the queue if a slower player has not yet started the hole.

**Question: How much time on average (in minutes) will a player save if you convert to the Priority queuing from First-In-First-Out queuing?**

Send your answer to [puzzlor@gmail.com](mailto:puzzlor@gmail.com) by April 15th, 2014. The winner, chosen randomly from correct answers, will receive a \$25 Amazon Gift Card.

*PuzzLOR is the creation of John Toczek. John is the Sr. Director of Decision Support and Analytics for ARAMARK Corporation in the Global Operational Excellence group. He earned his BSc. in chemical engineering at Drexel University (1996) and his MSc. in operations research from Virginia Commonwealth University (2005).*

# MemberMilestones

**George Akst**, MORS USMC Sponsor, is now the head of the 75-person Marine Corps Analysis Division.

**Nathan Bastian**, last year's Bonder scholarship recipient, will chair a session at INFORMS in 2014.

**Aaron Burciaga** recently left the service and is a civilian OR analyst. He is serving both on the MAS council and the MORS Board of Directors. Aaron was recently elected Vice President of the Maryland Chapter of INFORMS. This position automatically progresses to the role of President in 2015.

Major (USMC) **David Cote** has started the Summit Project, a living memorial that pays tribute to fallen service members from Maine who died during the wars in Afghanistan and Iraq. For information, visit <http://mainememorial.files.wordpress.com/2013/09/the-summit-project-brochure.pdf>

MAS Secretary/Treasurer **Walt DeGrange** is stepping down after many years of service in these positions as well as retiring from active naval service. We wish Commander DeGrange every success in the future!



**Tom Denesia** completed the annual Pike's Peak Ascent, improving his time from last year and finishing in 5 hours, 46 minutes, and 54 seconds. Tom admits that this may seem like a long time for a half marathon, but he reminds us

that the event starts at 6,285 feet and ends up at 14,100 feet above sea level. He claims to have jogged and walked fast, even though breathing above the 10,000-foot level is a real challenge!

**Jeff Hyink** was promoted to Captain, USN, and has assumed duties as the Operations Analysis Program Officer at the Naval Postgraduate School. Jeff's previous assignment was as Sea Strike branch head at OPNAV N81.

MAS President **Dr. William Fox** received the Harden-Simmons prize from the American Society for Engineering Education (ASEE) for his paper, "Mathematical Modeling of

the Analytical Hierarchy Process Using Discrete Dynamical Systems in Decision Analysis." The award recognizes the best paper in computational methods.



MORS President-elect **Raphael Matos** recently completed his PhD at Walden University.



**Norm Reitter**, MORS Director, has been named Director, Analytics at CANA Advisors, a small, woman-owned, veteran-owned business, based in Northern Virginia that provides integrated logistics, supply

chain, and company acquisition services to military and commercial clients.

Papers from MAS former president **Patrick Driscoll**, current MAS Vice-President **Chris Arney**, former Steinhardt recipient **Don Gaver**, and others appear in a special issue of the *International Journal of Operations Research and Systems Science*, edited by MAS President **Dr. William P. Fox**. See the MAS President's article for details.

This could have happened. **Mike Garrambone** was making a quick stop at the commissary accompanied by his mentor and friend **Mr. E.B. Vandiver**, FS. Mike was a little unnerved when asked the question he had heard many times before, "Paper or plastic?" His mentor took note of his demeanor, which prompted Mike to say, "Well, why do they always have to ask that question?" In a sage voice, his mentor quickly replied, "Garrambone, I've tried my very best with you. Every analyst knows that baggers can't be choosers."

**Submit items for Milestones to [phalanx@mors.org](mailto:phalanx@mors.org)**

# The Last Word

## Joint Warfare Analysis: The Key to Shaping DoD's Future

Arthur H. Barber III, Deputy Director, Assessment Division  
(N81), Office of the CNO, [arthur.barber@navy.mil](mailto:arthur.barber@navy.mil)

Affordability will dominate the US military's planning for the foreseeable future. America has a history of reducing defense spending following a war, and large-scale operations in our longest war are now coming to a close so defense funding is going down. Because of the debt and deficit situations that the nation faces today, it is likely that these developing reductions in defense spending will endure for a longer period of time than in previous drawdowns. The US military is caught between the funding constraints of this national budget environment and the steadily increasing capability demands of pacing new and globally proliferating technologies that sharply target US military strengths. Focusing flat or declining defense resources on the capabilities that matter most will be critically important over the next decade.

There is a great opportunity in this situation to use a thoughtfully structured program of joint capability analysis to identify the most cost-effective concepts of operations and types of capabilities to deal with our military challenges. Such analysis could also potentially identify the most promising directions for development of new

capabilities to deal with new classes of threats. Because so much of what we know about threats and much of what is most effective in our future capability are both classified above the SECRET level, this analysis would have to be done in a highly secure environment. Because US military operations are conducted jointly, the security environment would also have to be cross-service. Despite the existence of a framework for coordinating joint capability analysis that is tri-chaired by Office of the Secretary of Defense (OSD) Policy, OSD Cost Analysis and Program Evaluation (CAPE), and the Joint Staff J-8 but seldom exercised, this type of analytic coordination is not happening today on the scale and at the rate that the fiscal situation requires. Such work as is being done is being done separately by diverse segments of the Department of Defense (DoD), each working to their own well-intentioned individual agenda. The analytic community is not being utilized efficiently or effectively on a DoD-wide basis to do what we know how to do. No one is coordinating our collective joint efforts. We need to do better.

The foundation of warfare analysis is the definition (always somewhat speculative) of a campaign or scenario that provides the threat, geogra-



Arthur H. (Trip) Barber, III

phy, military objectives of both sides, political environment (what nations are involved in what manner), and a projected timeline of events leading up to conflict. This can be either an existing current-year operational plan (OPLAN) campaign from a combatant commander (COCOM), or a future-year defense planning scenario from the OSD (Policy). Both exist in significant numbers and the process of developing new or updating existing ones is fairly healthy, even if painfully slow. A key issue for analytic purposes is what scenario or combination of them should be used in what manner to provide the analytic framework for force and program planning. The exact blend of OPLANs and future-year planning scenarios to be used for force structure analysis is always a point of debate within DoD, especially

around Quadrennial Defense Reviews, but for most other forms of analysis, each scenario is evaluated separately. So the scenario foundation for analysis is fairly diverse and robust. But what about the structure above it?

The second step in joint warfare analysis is filling in the structural details of a campaign: how we project the enemy will proceed to achieve military objectives and how we would deploy and employ our own forces and capabilities to defeat this and achieve our own objectives. Obviously, this is even more speculative than scenario definition. The process for doing this involves a significant staff effort and the application of warfighter military judgment through workshops and wargames, either at the COCOM level (for OPLANS) or led by the Joint Staff for future-year scenarios. Once again, this is a step where there is a significant amount of effort underway. What is missing from this step at both the COCOM and the OSD levels is the systematic application of fully joint, highly classified campaign-level analysis to inform the selection of the courses of action and types of forces and capabilities that are most likely to be successful in achieving the desired outcome. Much of the work today uses no analysis at all; the rest uses table-top insights with spreadsheets or analytic structures and tools that do not incorporate all services appropriately and do not include the highest classification and most effective US capabilities. The services of the analytic community are not being used in the way that they could and should be.

So why is this critical step in joint warfare analysis, the application of campaign-level analytic techniques, being underperformed? The first reason is a philosophical prejudice against this type of analysis due to the complexity of the models and the long

chain of assumptions that are used in their inputs. OSD CAPE (formerly PA&E) disestablished their unique capability and staff for joint campaign analysis a few years ago over this issue, as did US Pacific Command (PACOM). Although the Joint Staff, PACOM, CENTCOM, and multiple OSD offices other than CAPE have seen a continuing need for this type of work and sought to set up replacement capability since then, none have had the staff resources and/or analytic expertise to succeed. The second reason for not having the right kind of joint campaign analysis is administrative. It is extraordinarily difficult to get bureaucratic approval to put all the technical details for highly classified programs from all services, along with the highest-classification threat information, simultaneously on the same set of computers on a sustained basis and then clear the number of working-level analysts that would be required to do wide-scale joint analysis into this whole set of information.

OSD (CAPE) is correct in saying that campaign analysis is built on many debatable assumptions and complex, labor-intensive models. The power of this type of analysis, however, is that it provides a structured common joint warfare framework within which essential elements of warfighting can be accounted for systematically. Good analysts can use this framework to establish a common operational context for detailed analysis of specific issues with mission-level models. Or they can use campaign-level models to compare the impact of changing scenario assumptions across a range of realistic possibilities. The campaign analysis provides a frame of reference, underpinned by real effectiveness calculations rather than purely military judgment, within which the value of specific systems, elements of force structure and their arrival

rate, new technology options, and various operational concepts can be compared quantitatively. The “scores” that are the direct campaign model outputs are not the value; qualitative comparative insights—often not obvious from intuition alone—about what is likely to work better and why are the key and unique result from the rigor of this framework.

Navy and Air Force use campaign analysis extensively for just these reasons, and began teaming to conduct multiservice campaign analysis incorporating their Air-Sea Battle concept of operations in 2010 after OSD disestablished the fully joint system. The insights that come from campaign-level analysis continue to be extremely useful to the leadership of these two services, and the products that have resulted from their joint effort have been eagerly sought by a range of offices in OSD and several COCOMs. The Defense Department needs this kind of joint warfare analysis work as one of the pieces of an analytic foundation for developing the best possible current-year OPLANS and for cost-effectively shaping the future US military.

The Navy-Air Force work, for all its strengths, still has one weakness. Neither service can populate its respective campaign-analysis computer systems (which both run the same model, STORM, using the same starting database) with the most highly classified or “black” programs of the other service. So each service has to complete the joint campaign with acknowledged programs then go off and do additional runs, separately by service, to fully incorporate their other programs. Although the Joint Staff has, after years of effort, achieved the bureaucratic authority to run campaign-analysis computers with all classified programs of all services, they do not have the

staff capacity or tour length for their largely military staff to do sustained work at the scale needed for fully joint large-scale campaigns. Interestingly enough, various offices in OSD other than CAPE have found such highly classified work useful to their mission and have been granted approval to do it on an episodic basis using nongovernment contractor facilities and staff. There is a clear need for a standing fully joint government-run campaign-level analytic process with full service participation. No one has taken charge at the joint level to assemble the authorities and resources to make this happen.


I spend a great deal of time trying to stay aware of what analytic work is being done throughout the Defense Department on warfighting capability issues of interest to the Navy. This is not easy; each time I think that I have found it all, I discover new pockets of well-intentioned effort being performed somewhere, much of it being done by the technical community of federally funded and university R&D centers with money from one separate office or another in OSD. Most of it is good in technical quality, but the work in each place is often based on entirely different starting assumptions about concepts of operations, scenario, etc., than other work on related

subjects done elsewhere. This makes for good debates about assumptions versus analytic conclusions, but makes it very difficult for any senior leader to integrate the results into a coherent picture, even if they were aware of all the results and the divergent assumptions behind them. And there is significant inadvertent redundancy of effort simply due to lack of awareness of what others are doing or have done. There is no single place or forum for coordination or even exchange of information of who is working on what analytic task. Each service has an internal requirement for such sharing and coordination within their own service, but there is no requirement or method for exchanging or sharing such information within OSD or at the joint level.

When resources decline, the importance of analysis increases. When every dollar in DoD has to be used efficiently, a carefully structured and comprehensive but nonredundant program for coordinated joint analysis should be a key element of making this happen. The Defense Department is in fiscal extremis right now, and we do not have in place a structured joint program of analysis that operates at the scale or with the focus needed to support DoD leadership's ability to

make good capability-based resource decisions. Each service separately has appropriately structured analytic programs that its own leaders use internally, and the services sometimes collaborate where they see opportunities, but they are doing this independently as coalitions of the willing. OSD operates on the separate analytic agendas of its multiple organizations. The DoD-wide joint analytic process has actually gone backward over the last several years, with the OSD/J-8 chaired joint analytic steering committee falling into disuse and DoD-wide campaign analysis being abandoned. Big program and force structure decisions are being made too often on the basis of individual topical and nonjoint analysis, if analysis is used at all. We can and must do better than this.

### About the Author

Arthur H. (Trip) Barber, the Navy MORS sponsor, has been the Navy's chief capability analyst as the Deputy Director of the CNO's Assessment Division (N81) for the last 12 years. He has 25 years of experience leading Navy budget, capability, and force structure analysis in the Pentagon. He is a Navy Senior Executive Service civilian and an engineering graduate of the Massachusetts Institute of Technology and the Naval Postgraduate School. 

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... **ISMOR Cornwallis** *Continued from page 43*

Union, the once bipolar world would be replaced by a multipolar one. The emerging national and international security problems would likely be quite different from those experienced during the Cold War. We would be faced not only with new problems, but also with new kinds of problems requiring new tools, new ideas, and new analytic approaches for solution. A different format would be needed for the proper exchanges among analysts. Thus, the Cornwallis Group experimented with scheduling fewer papers and allow-

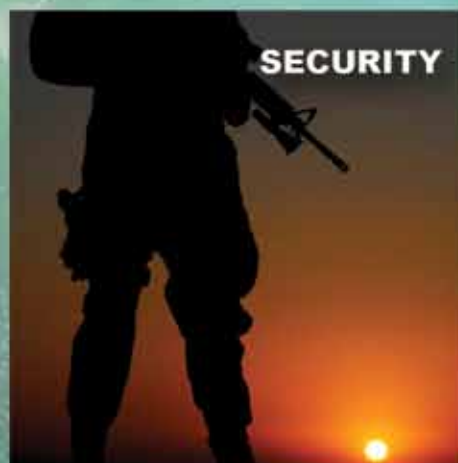
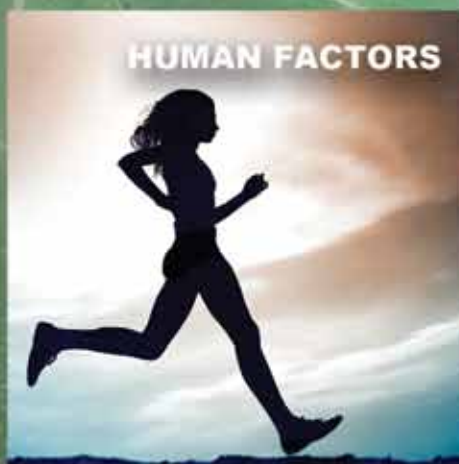
ing presenters sufficient time to fully explore their ideas and approaches in contradiction to the traditional format of symposia. The traditional formula provides for the maximum number of presentations, with 20 minutes of presentation and a few minutes for questions. The Cornwallis format allows for a great interchange between the speakers and the audiences. This unique approach has worked successfully, as the bookshelf of proceedings for the first 18 symposia attest. The proceedings are filed electronically on

the Cornwallis website ([www.thecornwallisgroup.org](http://www.thecornwallisgroup.org)).

As noted earlier, I am proud to be invited to deliver the Professor Ronnie Shephard Memorial Address at the traditional Thursday banquet during the symposium.

Further information can be found on the ISMOR website, [www.ismor.com](http://www.ismor.com), or by contacting Gene Visco at [evisco4@cfl.rr.com](mailto:evisco4@cfl.rr.com) or Eugene. [visco@lmco.com](mailto:visco@lmco.com). 

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